THE

VETERINARY JOURNAL

DECEMBER 1901.

Editorial.

ON THE DESTRUCTION OF CARTHAGE.

A VERY foolish and extremely spiteful letter has been called forth or suggested by a recent article in the VETERINARY JOURNAL, and has been printed in the *Veterinary Record*. If it had been merely foolish we should have ignored it, and left it to the ridicule which it deserves; we remember the advice of the Eastern sage, who warns us not to answer a fool according to his folly. But the letter is, as we have said, spiteful as well as foolish, and it is essentially vindictive, almost truculent, in its tone, and has probably reached the ears or eyes of a great number of our professional brethren through the indulgence—we hope it is not the weakness—of our brother editor. The writer of the letter does not venture to give his name, but prefers to hurl forth his fulminations under a pseudonym. We were going to say a *nom de guerre*, being seduced by our antagonist's bad example, who is proud of his learning, and wants to show it by dragging in at all costs scraps of Latin, old Persian, and modern French; but we forbear. In the first place, whilst we proclaim our respect for other literatures and other languages, ancient and modern, we prefer to use good homely English in addressing a body of sturdy Englishmen; and in the second place, we think that "war" is hardly the term to be applied to this poor attack on the part of the unknown correspondent of the *Record*. That gentleman, being perhaps acquainted with French, may remember the comment made by the gallant Marshal Canrobert on the charge of the Light Brigade at Balaclava: "C'est magnifique, mais ce n'est pas la guerre." In his case we would say of his charge, "It is not magnificent, and it is not war."

The very signature is redolent of malignity. "Delenda est Carthago" was the phrase constantly reiterated by Cato in the Roman Senate, as every schoolboy knows, at the time when he wished to impress upon his countrymen the need of crushing out a dangerous and remorseless enemy. It may be paraphrased to mean, "That which stands in the way of our greatness must be removed at all hazards." The "greatness" in this case is presumably the unknown correspondent of the *Record;* that which stands

XUM

in his way is the existence of the Veterinary Colleges. Now let us see how he wishes to act the part of Cato. (We are very sorry for Cato. If any notice of these sayings and doings should reach the Elysian fields he will be very angry at the profanation of his great name, and yet will have no power to retaliate.) This modern Cato, then, wishes us to accept one of two alternatives,—either efface ourselves decently, or go on without murmur or warning to fight the unequal battle, in which this faint-hearted warrior will take no part. "Efface ourselves decently" is a fine phrase, when applied to other people. It is slightly reminiscent of the theatre (we do hope our readers won't call it stagey), and one almost imagines one sees this Cato offering us his dagger in order that we may plunge it into our sorrowful heart. But we have not got to that point yet. To bid us, on the other hand, be warmed and clothed without offering us food or raiment, is just the kind of conduct that called down the sternest apostolic rebuke, as Cato will find if he reads the Epistle of Saint James next Sunday morning.

Cato is nothing if not incoherent and illogical. In his ravings he becomes absurd, and even, we fear, disloyal. Like a stage tyrant he rants about "the supposed injustice of the Government being unwilling to squander English money on Scottish institutions." We are not aware that Scotland has ever failed in its contributions to the national revenue; we understand that King Edward is king, not of England only, but of Great Britain and Ireland, and of the British Dominions beyond the Seas. Let our foolish friend take a shilling from his pocket and, being a Latin scholar, let him read the titles of our late Queen if he has any lingering doubts on this point. We are told we are dismal because Ireland started a school of her own; was this school started with purely Irish money? And, by the way, Cato might inform us how the Treasury officials distinguish English money from Scottish, Irish, and Welsh money. There must be some trick in the thing, because Cato says there is, but how is it managed? Our curiosity has been whetted by his amazing statement.

As a fine sample of confusion of thought, we find in one paragraph of the letter before us the following judicial *dictum*:—"If Scotland, with its small population, had been content to run only one veterinary college, there would never have been any cause to complain;" followed by this: "Let us have a new régime, then, and start fairly under the ægis of the famous universities of the north." Our readers will observe the plural form, and remember there are four universities in Scotland. (In the interval we have some rhodomontade about our Scottish ploughmen—which word, by the way, Cato spells incorrectly—being for centuries as scholarly as England's gentry.) Now observe the fatuities. What has the population of Scotland to do with the number of colleges? One might as well talk about the absurdity of there being twenty colleges at a small unimportant place like Oxford, or sneer at St.

XUM

Andrews, a small seaside town, for daring to have a university all to itself. Are all the Oxford students Englishmen, or all the students of St. Andrews Scotsmen? Did not Oxford, to take one solitary instance, train a brilliant Scot and make him Archbishop of Canterbury? Is there anything inherently absurd in the ambition of Scotland, "with its small population," to have famous veterinary schools, as it has, even by the admission of our swaggering Cato, "famous universities"? As a matter of fact, have not many of the celebrated veterinarians of the day, perhaps a majority, including the Principals of all the colleges, been trained in Scotland? Is Cato so hide-bound by his geography as not to see that learning is independent of such trivialities? Has he ever cast his eyes over Europe, and reflected upon .the fact that Tübingen and Göttingen, great centres of learning though they be, are not great centres of population?

We do not wish to weary our readers by pointing out all the self-contradictions of the blear-eyed critic of our scholastic system, but we must take notice of some of his most glaring fallacies. He is evidently a great admirer of the Royal Veterinary College of London, and seems to hold a brief for that establishment, his praise of it is so blatant. Does he know that this College scandalously undersells everybody by accepting a yearly fee of only two guineas from even the largest horse-owners in the Metropolis for attending their animals? Of course the great brewers must chuckle over this excellent bargain, which enables them to pay bigger dividends to their shareholders. No doubt this wholesale absorption of practice, quite worthy of Tammany, must on the whole, London being so vast, pay the R.V.C., and make it "even anxious to avoid State aid;" but is that wonderful; is the policy of the College even respectable? As for the anxiety on the part of the R.V.C. "to welcome the enhanced educational and professional standard"—the less said about that matter the better. If Cato had read the debates in the R.C.V.S., or our humble criticisms thereon, he would have avoided this palpable nonsense. In another part of his wonderful production Cato sneers at our suggestion that veterinary education might be made the care, if not of the Government, at least of our wealthy citizens. Does he see what this sneer involves, and how far it reaches? Has he never heard of General Fitzwygram and his noble generosity? And, whilst we are on this subject, let us ask this wise reformer how often the Fitzwygram prizes have gone to his pet College as compared with the Edinburgh Colleges. Would Sir Frederick Fitzwygram be glad to see Carthage ruined? We will take a wider survey. An eminent statesmen said recently that he owed the inestimable privilege of being educated at Oxford to the far-seeing benevolence of a pious bishop of the 14th century, who set aside a portion of his means for the foundation of a scholarship at that famous University. If we may be proud of the benevolence of 14th century bishops, and

grateful for it, why in the world may we not be proud of the benevolence of men of the 20th century? Bishops are comparatively poor men now-a-days, but, thank Heaven, we have millionaires ready and willing to take the place of bishops and other pious founders, and see to a more equitable distribution of the world's wealth. We strongly suspect this sneering and ill-informed critic of selfish and worldly motives. He hints darkly that the legacy of Professor Dick was not left necessarily for the support of the Dick College, but "for the support of veterinary science generally." Is he hankering after the flesh-pots of Egypt? We hope not. Fancy the Dick Trustees subsidising Cato! But let them take care, for the avenger is probably on their track. We are told that "the Dick College was very heavily endowed as well as old-established," and we fancy that the Trustees are to be called to account for the manner in which they have squandered the money. By the way, it strikes us as rather comical that Professor Dick was able to confer upon his College the double gift of wealth and antiquity of foundation at one stroke, so to speak. But grammar and logic are not the strong points of our critic, and we leave the riddle to our readers. As for the assertion that the three Scottish Colleges owe their origin to opposition, we hardly know whether we ought to be angry or merely contemptuous. Is there not such a thing as healthy rivalry? If not, why is the nation so busy in establishing fresh schools and universities all over the country? Why not sit down quietly and slumbrously and say, "You have Oxford and Cambridge, Edinburgh and Glasgow, London and Dublin: be content, and go there for your education, if indeed you want it." What we complain of is the want of public support and national interest in a great and increasingly important department of scientific education. It is most regrettable that such critics as this Carthaginian person exist or are allowed to publish their opinions. We trust he is not a qualified veterinary surgeon, for he is faithless to his profession and to science. He is like a man who should say, "Let there be death; when that has taken place, and is certified as beyond doubt, we will use our magic art in reviving the corpse or in reconstructing tissue. Solution of continuity did you say? Nonsense! we care nothing for such old-fashioned theories, such antiquated prejudices. Give us endowments and we will astonish the world." We do not doubt it.

Dr. Carnegie's Munificence.

We have just learned from Prefessor M'Cormack, Secretary to the Carnegie Trust for the Universities of Scotland, that if a youth have the following qualifications his College (Veterinary) fees will be paid by the Trust for him:—

(1) He must be over sixteen years of age; (2) must be of Scottish birth or extraction, or must have given two years' atten-

dance after the age of fourteen at a school or institution under inspection of the Scotch Education Department; and (3) must be qualified by Preliminary Examinations under the Ordinances of the Scottish Universities Commission and the regulations of the Joint Board of Examiners to attend the classes for which payment of fees has been claimed.

We feel sure that there are many young men desirous of entering the profession, but debarred by the unfortunate lack of money from doing so, and to such young men we wish our readers to point out this great opportunity and privilege.

Original Papers.

ON CEREBRAL THROMBOSIS IN THE HORSE: A CLINICAL STUDY.

BY CHALMERS WATSON, M.B., F.R.C.P.E.

In the March number of this Journal I drew attention to the important part which members of the veterinary profession can play in advancing the knowledge of disease in the human subject, basing my remarks on two cases of chronic disease in the central nervous system in horses which I had the opportunity of examining during life and investigating after death. To revert to this subject, the following remarks will be based on the admirable clinical note on a case of brain lesion, recorded by R. Rutherford, F.R.C.V.S., in the May number of this Journal. Through the kindness of Mr. Rutherford I had an opportunity of seeing the patient on the 6th May, and have had the case repeatedly under observation since that date.

In the present paper I shall describe and illustrate the clinical features as they appeared to me on that date, and thereafter shortly discuss some of the leading points of this most interesting and probably unique case. It may be advisable to give a short account of the mode of onset and history of illness, as taken from Mr. Rutherford's paper, and from the attendant in charge.

The horse in question was an eight-year-old "Yankee." On Monday morning (April 1st) his breakfast was hardly touched, and it was observed that he was otherwise not very well. The movements of the hind limbs were especially awkward, and he required to be whipped all the way down the gangway. He was put in a loose box, and the surgeon sent for. He found him strangely stiff, as if fixed to the ground. The animal could be made to back, but it was exceedingly difficult to get him to move forward. During a later examination he had a convulsive seizure, in which the head was thrown upwards, and to the near side. This lasted ten minutes, and then he appeared to recover.

In the evening of the following day (April 2nd) he had another fit, and fell to the ground unconscious. He was found by Mr. Rutherford "lying perfectly unconscious, all sensation and power to move his limbs completely lost; lips retracted; tongue hanging out; breathing very shallow, and with a hard but not much otherwise altered pulse." Mr. Rutherford subsequently

informed me that the vessels in the neck felt like small rigid cords. He was bled freely till the character of the pulse altered. The bowels were emptied; cold water was applied to the head, and he was placed in a comfortable position—instructions being given for him to be turned from time to time so as to avoid the formation of bedsores.

Next morning (April 3rd) consciousness had partially returned, and with it some use of his hind legs. He made efforts to rise—the efforts, however, were so dangerous to himself (risk of breaking his back) that he was hobbled. He was then kept quiet by the administration of half-ounce doses of chloral and potassium bromide every four or five hours. On the following morning (April 4th) consciousness was still more restored, and he took a drink of water.

On April 6th bedsores developed, which on the 7th began to look very serious, but on that evening he was able to rise without assistance. On April 8th it is reported, "Standing quietly all night, but he is an object with bedsores. He is quite unable to hold his head up, with the result that it is enormously swollen." A platform was fixed up in front of him on which his head might rest. The odour from his mouth was sour, and he was treated with ounce doses of sodium hyposulphite.

From April 9th to 24th he made steady improvement, and the note on the 24th reads as follows:—"He can walk quite freely, and there is no paralysis of any part, partial or otherwise."

When my attention was drawn to the case I took an early opportunity of visiting the animal in the company of Mr. Rutherford, and the photographs I., II., and III. were taken on the day following, May 7th. At the same time I tested the animal along the lines laid down by me in a former paper for the investigation of so-called nervous affections in horses, and found the following well-marked symptoms:—

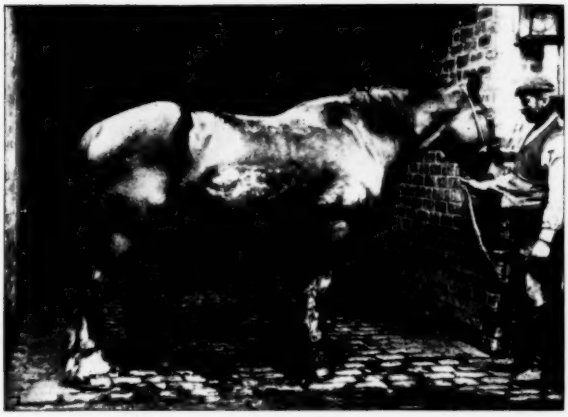
Firstly. Manifest paresis of the muscle sense, indicated by the ataxic positions shown in the photographs, especially I. and II. Plate I. shows the hind limbs further apart than normal, the off limb being slightly everted at the stifle-joint; the fore limbs also are too far apart. Another characteristic attitude is brought out in Plate II., which shows the hind limbs crossed, and the fore limbs too far apart. Still another abnormal position is shown in Plate III., where the near hind limb is inverted too much under the belly of the animal, while the off hind limb is everted and looking in the opposite direction.

Secondly. On walking, there was distinct irregularity and want of co-ordination in movement of both fore and hind limbs, especially of the latter. In addition, a distinct paresis was indicated by the manner of raising the limbs generally, but especially the toes in front and the fetlocks behind. On turning, he showed manifest indications of stringhalt.

Thirdly. The bedsores are well brought out in the illustrations, but it should be noted that they represent little more than half their original size. Photo. I. shows extensive ulceration over the shoulder, and to a smaller extent over the eyebrow. Similar lesions on the hind quarters and fore legs had healed, and are imperfectly brought out in the illustrations. In Photo. III. the narrow white bands seen above the ulcerated areas on the haunch and side are artificial, and are intended to indicate the whole area originally affected.

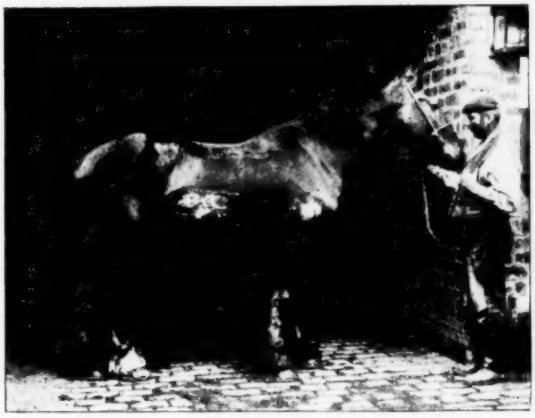
(Photo. IV. was taken on November 25th, after the animal's return to town. It shows the areas originally affected with bedsores, with the hair on these parts turned completely white.)

XUM



No. I.

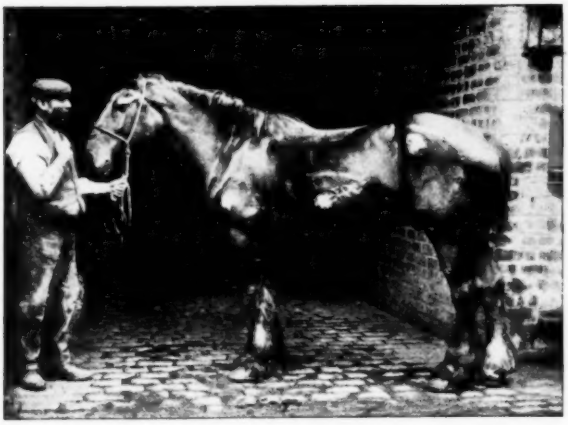
The hind limbs are too far apart, and the off hind limb is slightly everted at the stifle joint. The fore limbs also are too far apart. Bed-sores are visible over the side and shoulder. Note the dull apathetic mental condition (*cf.* Plate IV.)



No. II.

The fore limbs are a little spread out, and the hind limbs are crossed.

XUM



No. III.

This plate shows an unnatural position of the hind limbs (see text), also bedsores over the eyebrow, shoulder, side, and haunch. The state of the ears in plates I., II., and III. is characteristic of an animal whose hearing power is dulled (*cf.* Plate IV.)

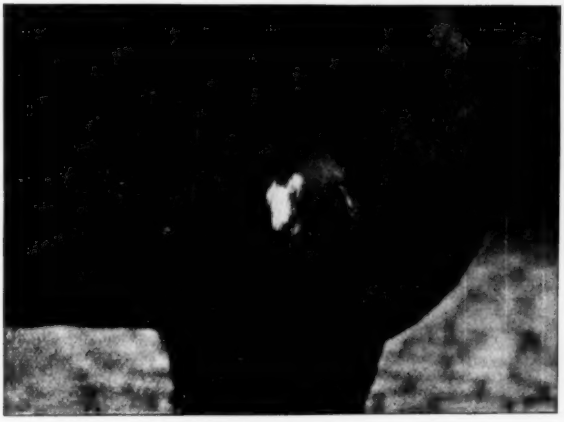
No IV.

Restored to health and in active service. The hair at the site of the original bedsores is permanently altered.

Contrast the dull apathetic mental condition suggested by the previous photographs with the more active mental state here indicated by (*a*) the condition of the ears, and (*b*) the attitude of the attendant.

No. V.

Shows permanent alteration in the colour of the hair at the site of the original bedsore.



No. VI.

Shows—i. Permanent alteration in the colour of the hair at the site of bedsore on shoulder; and

ii. Immediately above it a depression corresponding to an area where a large mass of muscle sloughed away at the time of the bedsore formation.

XUM

A week later I found the animal very considerably improved: the stringhalt was hardly demonstrable; and the indications of weakness and inco-ordination were much less marked. The animal had improved every day, and had evidently been very favourably influenced by the daily exercise, which constituted part of the treatment.

On June 3rd the animal was sent to the country, and was put to grass for three months. His attendant informed me that he went perfectly sound, and at the end of his eight-mile walk showed no indications of his illness. Careful inquiry, however, elicited the fact that the mental state of the animal had certainly undergone change, the following clinical symptoms being manifest:—

1. A general alteration of temper shortly described by the term "dourness." This was foreign to his nature.
2. The animal could not be tied up either in a stall or to a ring. On two occasions when this was done he was exceedingly violent, and it was thought that he would strangle himself.

The animal was brought back to town, and re-started work in the end of September, and now (November) is working as well as ever. The mental symptoms referred to have disappeared: the only point noticeable now is that he is perhaps not quite so responsive to a touch of the whip or to the voice as formerly. Photo. IV. shows that both the mental and bodily states are very different from those present during the acute illness.

I shall now briefly refer to a few points of the deepest interest from the standpoint of human medicine:—

Firstly. The manner and time of onset of the disease, with the state of the blood-vessels so aptly described by Mr. Rutherford, tend to indicate that we are dealing with a state of toxæmia probably associated with the slower tissue change resulting from twenty-four hours good feeding and no work in an animal predisposed to a certain line of toxic action.

Secondly. The case was evidently one of cerebral thrombosis, and it is important to note the manner in which recovery from the symptoms was brought about—daily exercise being an important part of the treatment.

Thirdly. In addition to the therapeutic point—the use of exercise—already referred to, the measures resorted to successfully at the early stage of the disease in order to overcome the toxæmic state, viz., blood-letting and free purgation, while they reflect great credit on the skill of the surgeon in charge, are very highly suggestive to the medical practitioner. The venesection undoubtedly saved the animal's life.

Fourthly. The appearance and disappearance of the symptoms of stringhalt are of very great interest. In a former paper I have suggested that *some* cases of stringhalt are dependent on a degeneration in the lateral columns of the cord, comparable to the condition of lateral sclerosis in the human subject, and the symptoms of stringhalt here were doubtless referable to descending degeneration in these columns. This case bears out the author's view as formerly expressed.

Fifthly. The mental symptoms are also of interest as showing the close parallel that exists between disordered mental states in the horse and man.

Sixthly. The bedsores suggest many points of interest in comparison with kindred conditions in the human subject. They are eloquent of the influence of bacterial action in tissues whose blood supply is interfered with by deranged neurotrophic influence, and the present altered condition

of the hair is important as indicating a permanent interference with local nutrition resulting from the lesion.

On these grounds I would again plead for a thorough investigation and careful record of cases of acute and chronic diseases in the horse and other animals, with the object of adding materially to our knowledge of similar diseases in the human subject.

VETERINARY EDUCATION IN HOLLAND.

Food for Reflection.

We here append in brief the Syllabus of the Course at the Utrecht Veterinary College, and beg our readers to compare it with the Veterinary education in this country. When the South African war is over no doubt there will be veterinary surgeons from Holland and veterinary surgeons from Britain in competition in the new Colonies.

First Year.

Winter Session.

	Theoretical. Hours per Week.	Practical. Hours per Week.
Inorganic Chemistry,	3	—
Physics,	6	—
Zoology,	5	—
Anatomy,	6	6
Shoeing,	—	2
Pharmacy,	—	1 every other week.

Summer Session.

Inorganic Chemistry,	6	—
Physics,	5	—
Geology,	2	—
Botany,	4	—
Anatomy,	3	6
Natural History and Breeding,	6	—
Shoeing,	—	2
Pharmacy,	—	1 every other week.

Second Year.

Winter Session.

Anatomy,	6	6
Histology and Physiology,	5	—
Organic Chemistry,	5	2
Materia Medica,	2	—
Pharmacy,	1	2
Shoeing,	—	4
Botany	—	2

Summer Session.

	Theoretical. Hours per Week.	Practical. Hours per Week.
Anatomy,	3	4
Histology and Physiology,	5	4
Embryology,	1	—
Organic Chemistry,	2	2
Pharmacy,	1	2
Dietetics, and Poisonous Plants and Botanical Medicines,	3	Excursions.
Shoeing,	2	4
Hygiene,	4	—
Cattle Breeding,	2	—

Third Year.

Winter Session.

General Pathology,	2	—
Pathological Anatomy,	3	3½
Teratology,	1	—
Obstetrics,	4	—
Shoeing,	—	2
Pharmacy,	—	1
Microscopy,	—	4
Surgery and Bandaging,	—	3
Clinical Medicine,	—	2
Clinic,	—	15
Surgical Anatomy,	—	1

Summer Session.

Pathological Anatomy,	4	Demonstrations.
General Therapeutics,	3	—
Materia Medica and Toxicology,	1	—
Special Pathology and Therapeutics,	3	—
Surgery,	3	2
Surgical Operations and Bandaging,	2	—
Diseases of the Feet,	2	—
Obstetrics,	1	3
Clinic,	—	15

Fourth Year.

Winter Session.

Pathological Anatomy,	1	—
Special Pathology,	2	—
Helminthology and Infectious Diseases,	4	—
Surgery,	3	—
Ophthalmology,	1	—
Operations,	2	2
Materia Medica and Toxicology,	4	—
External Anatomy,	—	2
Food Stuffs,	—	1
Pathological Anatomy,	—	Each day.
Outside Clinical Work,	—	—

XUM

Summer Session.

	Theoretical. Hours per Week.	Practical. Hours per Week.
Veterinary Jurisprudence,	4	—
Ethics,	2	—
Epizootics,	1	—
History and Literature of Veterinary Science,	1	—
Pharmacy,	—	1
Surgery,	—	2
Clinical Medicine and Surgery,	—	15
Outside Clinical Work,	—	—
Meat Inspection,	—	2
Practical Pathology,	—	Daily.

Each entrant must have passed a preliminary examination in natural science.

Each entrant must produce a certificate that he has been a pupil for two years with a duly qualified veterinary surgeon.

Each entrant must produce a certificate that he has been present at at least ten cases of parturition in one of the larger animals, and has assisted in at least two cases of difficult parturition.

Each entrant must be at least seventeen years of age, and must pass an examination in—

Dutch.
Elements of German and French, so as to translate at sight into Dutch.
Elements of General and National History.
Elements of Geography.
Arithmetic and Algebra.
Geometry and Planimetry.

The candidate must be able to measure right angles, triangles, solid bodies, and calculate the superficies and contents of prisms, pyramids, cones, cylinders, convexities, &c.

Winter Session commences first Tuesday in September, ends on 31st January (nineteen weeks).

Summer Session commences 1st February, ends 15th July (about twenty-eight weeks).

There is a vacation of seventeen days at Christmas and at Easter.

THE SIGNIFICANCE OF SUPERNUMERARY DIGITS IN THE HORSE, WITH RECORDS OF TWO RECENT CASES.

BY HENRY TAYLOR, NEW VETERINARY COLLEGE, EDINBURGH.

The occurrence of supernumerary digits in the horse is interesting alike to the obstetrician and to the palæo-zoologist, to the former because of its teratological aspect, and to the latter because of its connection with atavism or reversion to a more primitive type. Supernumerary digits are of not infrequent occurrence in the Equidæ, and though there are several cases

recorded they are always interesting. Professor Cossar Ewart, Professor Shave, Mr. Goodal, and Mr. Parker, have all recorded cases, but it is very probable that instances are much more often met with than the examples recorded would lead one to suppose, for the simple reason that the general veterinary practitioner in a country practice where the breeding of stock is carried on is not as a rule afflicted with *scribendi cacoëthes.*

The expression supernumerary digits instantly carries our mind to reversion; but it must not be concluded that all cases of supernumerary digits in the horse are cases of reversion, because extra digits may also arise by dichotomy: by this we mean a simple splitting or fission of either a limb or in fact any other part of the body. This is a state of affairs of much more frequent occurrence, but of infinitely less interest than atavism. In the majority of cases of polydactyly in the horse no attempt seems to have been made towards distinguishing between mere duplication of the digits and atavism.

In reflecting upon the tendency to reversion a brief glance at the genealogy of the horse may be of interest, to see to which of the primitive types the horse tends to revert, which digits are restored, and in which limbs, fore or hind.

The horse of to-day, it has been undoubtedly proved, is connected by a fairly complete chain with polydactylous forms which lived in the Eocene period. The Phenacodus, an animal which lived at this time, and which had five complete digits on each foot, is regarded as the common ancestor from which the horse tribe sprang. The Phenacodus, or rather its extinct remains, were first made known by Cope in 1873 from some molar teeth from the beds of the New Mexican Wasatch. In 1881 Wortman discovered the greater part of the skeletons of two distinct species of this genus, and from these many interesting facts have been elucidated. "This animal possessed five well-developed toes in functional use on all the feet, of which the first is the smallest, the median is the largest, and is symmetrical within itself. The feet are considerably shortened, and were probably semi-plantigrade." In the succeeding generations forms occur which had fewer number of functional digits. Hyracotherium and Systemedon had only four functional ones.

The most ancient member of the Equidæ at present known is the Eohippus. This was discovered in the Lower Eocene of New Mexico by Professor Marsh. This animal possessed four toes and a rudimentary one on the fore, and three toes on the hind limb, all the digits terminating in hoofs. Orohippus had also four toes in front and three behind, but the rudimentary first digit found in the fore limbs of Eohippus has disappeared. Orohippus was not nearly so large as our modern horse, being only about the size of a fox. Ancitherium, a genus allied to the Equidæ from the Miocene period, had three digits, or three and a rudimentary one. Mesohippus, which was about as large as a sheep, and lived in both the old and the new world in the Lower Miocene period, possessed three toes. The fifth metacarpal was a splint-like bone, about as long relatively as the fourth metacarpal is in our modern horses. The fifth metacarpal is present in Miohippus, also belonging to this epoch, but it is very short. Miohippus was a tridactylous form with the toes of nearly equal size.

Later on, in the Pliocene period, there were two types of three-toed horses, Protohippus of the new world, and Hipparion found both in the new and the old. In Hipparion the fifth metacarpal appears to be seldom, if ever pre-

XUM

sent, and the third metacarpal is much shorter, the outer toes have ceased to be of use, and do not touch the ground. Hipparion, though anatomically three-toed, is thus only functionally single-toed. The second and fourth digits have diminished in size, and take no part in bearing weight. They were visible externally, and provided with hoofs. Professor Cossar Ewart looks upon Hipparion as the common ancestor of the asses and zebras, whilst Protohippus he considers to have been the ancestor of all recent breeds of horses. Some of the species of Protohippus almost equalled the ass in size; the structure of the feet resembled that of Hipparion. Pliohippus, another Pliocene form, resembles our modern horses in having a single functional digit, the second and fourth digits being represented by rudimentary splint-bones, concealed beneath the skin.

It seems to be generally held that in Hipparion the second digit persisted longer than the fourth. Hensch says in his researches on the Hipparion that the innermost digit (the second) was the last to go; and Professor Cossar Ewart says in "Development of the Skeleton of the Limbs of the Horse":—"It is well known that in the horse the phalanges of the second digit are more frequently restored than those of the fourth. The restoration of the second digit is in fact so frequent that there is no escape from the conclusion that the second digit persisted longer than the fourth in the horse family. It has even been suggested that 'an ancestor of the horse may yet be found with the second and third toes alone developed.'" We may take it, then, that when reversion does occur in the horse that the most frequent examples are of the restoration of the phalanges of the second digit, and this statement is borne out by the two examples at present in the museum of this College, and also by the one I am about to describe. Moreover, Gegenbauer insisted that in a case of atavism the restored parts do not resemble those of palæontologically remote ancestors, but those of more recent date: so in the horse the tendency as regards the limbs seems to be to revert to the Hipparion, a not very ancient form, and by some regarded as the immediate predecessor of the horse. As a further proof of the relationship of Hipparion to the modern horse, developmental researches by Professor Cossar Ewart upon the embryos of the horse have revealed in their ontogeny a stage which bears a more or less close resemblance to Hipparion, in the limbs at any rate. In these the vestigeal remains of the phalanges of the second and fourth digits were found in the buttons of the splint bones. The joint, however, between the first and second phalanges of the second digit had almost disappeared. In one embryo also the second metacarpal was found to be distinctly longer than the fourth.

The cause of the reduction in the number of digits in the Equidæ is quite easily understood if one looks at their immediate relations in the animal world. In the artiodactyl group, in addition to the horse, we have the tapir and the rhinoceros, these animals being dwellers in swamps or forests.

The ancestors of the horse seem to have forsaken their former environment and taken to the open field. Here, not being endowed with defensive structures, speed became a desideratum if not an absolute necessity if they were to exist. Now in plantigrade animals the toes are arranged in a semicircular manner when placed on the ground. In the act of running the heel and wrist leave the ground first, followed by the digits, the median one having the greatest share in propulsion. This process in digitigrade animals, whose only safety practically lay in flight (not being cut out for

defensive operations against their enemies) has by its infinite repetition resulted in the strengthening of the median digits, with a corresponding reduction in the outer ones. This is only in strict accordance with Nature's law of the use and disuse of parts. This diminution in the number of toes has proceeded step by step until the modern one-toed horse has been reached. The median metacarpals and digits not only became strengthened but also lengthened. Length of leg within certain limits means swiftness; hence those animals endowed with these characteristics survived best both the migrations of the herd and the attacks of enemies. We must not imagine that Nature's efforts towards the evolution of our modern horse, although they proceeded step by step, did so in an unbroken line, not meeting with retrograde forces which showed themselves at times. Even after the lapse of centuries, instances like the present crop up, and show us the zigzagings of the two contending forces. As Tennyson beautifully puts it :—

> "Forward, backward, backward, forward, in the immeasurable sea,
> Sway'd by vaster ebbs and flows than can be known to you or me,
> Evolution ever climbing after some ideal good,
> And Reversion ever dragging Evolution in the mud."

Polydactyly occurs in man as well as in the lower animals. There are several recorded cases of people having six or seven fingers or toes, and it has been endeavoured by some authorities to explain these abnormalities also by the theory of atavism. But the theory of regarding polydactyly as atavistic does not apply with the same force to man as it does to the Equidæ, for whereas it is easy to demonstrate the relationship of the Equidæ to species having more than the one digit, it is by no means so easy to find any mammal possessed of more than five digits to which man had reverted. True, the theory of a primitive heptadactyle mammalian limb has been advanced by von Bardeleben, but, as Wiedersheim points out, palæontology does not bring forth one fact in favour of the idea that terrestrial animals ever possessed more than five digits on hand or foot, and his view is no doubt the correct one.

Although we cannot therefore apply the atavistic theory to explain the presence of supernumerary digits in man, it is quite clear that in mammals having fewer than the typical number of digits (five), reversion can and does occur.

Besides the theory of atavism there are two others advanced to account for polydactyly. The first seeks to explain it as being due to something influencing the embryo from without, such as "mechanical constriction by threads of the amnion." Ahlfield has described a case of a child with a double thumb, which, he said, was caused by an amniotic thread lying between the two thumbs. Other cases due to a like accidental cause have been also recorded, but this theory does not explain the hereditary character of polydactyly which is seen in man, and still less, as noticed by Dr. Gregg Wilson, does it account for the intermittency and variation in the position of the abnormality.

The remaining theory ascribes the cause of polydactyly to "germinal variation." This really embraces the atavistic theory, because for the ancestral digits to develop there must be a variation from the usual condition favourable to the development of those rudiments. Weismann (Germ-plasm) goes a little further than this theory, and ascribes the presence of supernumerary digits to the effect of an excess of nutrition, quite local,

XUM

on a group of determinants, and the result is a duplication, splitting, or doubling of that group or of those determinants. It is easy to imagine that a superabundance of food supply could cause the doubling of either a single primary cell or a group of cells, whether large or small, and Gerlach and Dareste have by modifying the conditions of respiration and temperature produced teratomata, some of them double forms. This theory appears to suffice for many cases of polydactyly.

There have lately been added to the College Museum two specimens of supernumerary digits in the horse. They were presented by Mr. Inglis, M.R.C.V.S., Forfar, and were taken from the two fore limbs of a foal (Clydesdale, I presume), upon which he was asked to give an opinion. The foal was then one day old. As the animal was not likely, from a utility point of view, ever to have been of much value, he was destroyed and the limbs sent to the College.

The off fore limb is the more interesting, and is an example of atavistic polydactyly. There are two separate digits, the supernumerary one being found on the inside. It is shorter and not so well developed as the adjacent one. In the fresh state both digits had a separate covering of skin and hair, and as an interesting fact it may be noticed that neither were possessed of ergots. Both digits are bent at their metacarpo-phalangeal articulations towards the median line at an angle of about 45°. The outer small metacarpal (fourth metacarpal) appears to be of normal size and shape. The large metacarpal (third metacarpal) is compressed laterally by the inner small metacarpal (second); its distal extremity is less in its transverse diameter than normal, and is devoid of an articular ridge. In length it measures 19·5 cm., whilst the three phalanges measure appropriately 12 cm. The phalanges are not much different from the normal, except that the proximal end of the proximal phalanx is minus the articular groove.

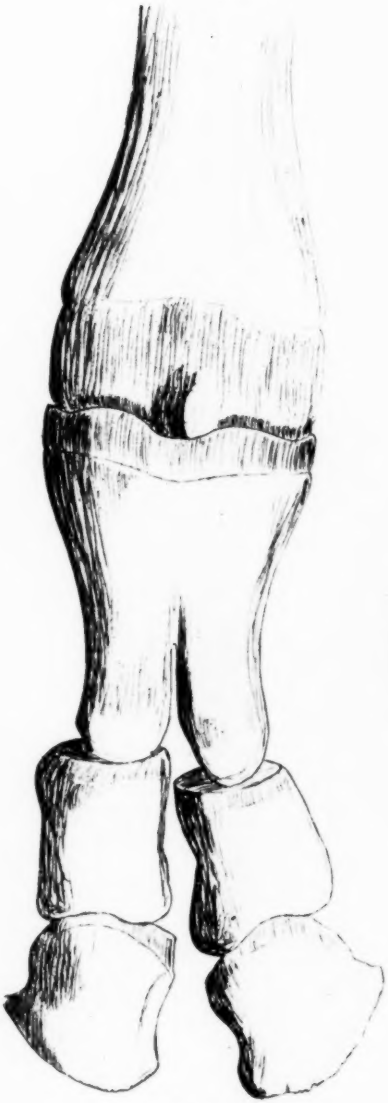
The internal metacarpal (second) is much larger than these bones usually are, and carries the supernumerary digit. It is expanded both at its proximal and distal extremities, its internal surface from above to below is concave, its external surface contacts the large metacarpal throughout almost all its length, the distal extremities of the two metacarpal bones diverge, and they are here separated by a distance of 1·8 cm. The distal extremity of this second metacarpal has a rounded articular head, which articulates with a cup-shaped depression on the proximal phalanx.

In length the second metacarpal measures 17·8 cm. The proximal phalanx or os suffraginis is 4·9 cm. long. At its superior extremity it has a cup-shaped articular surface for the second metacarpal, but its inferior extremity, instead of being expanded laterally to form a wide articular surface, terminates in a rounded extremity and is comparatively small. There is no bone for it to articulate with, but it is continued by a pad of fibrous tissue which in turn supports a hoof.

It must be noticed, then, that this supernumerary digit is not restored in all its completeness. The bones that are wanting, viz., the os corona, the os pedis, and the os naviculare, we may take to be represented by the pad of fibrous tissue. It seems rather peculiar that when these bones are missing we have still a hoof formed. The hoof belonging to this supernumerary digit is long and pointed. The internal surface has a well-marked cutigeral groove, and the horny laminæ are quite distinct, the heels also are quite evident. The length from the proximal end of the os suffraginis to the tip of the hoof is 8·8 cm.

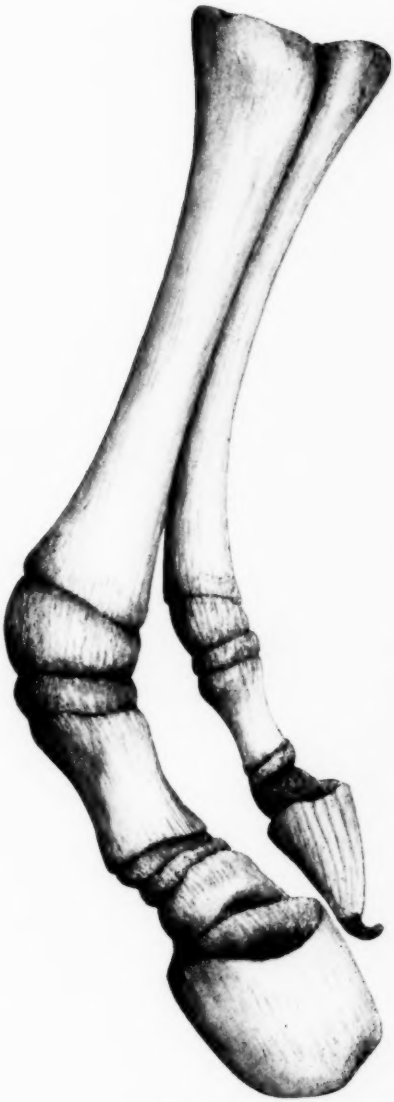
XUM

PLATE II.



Left fore limb.

PLATE I.



Right fore limb.

In cases of reversion we sometimes find an increase in the number of the bones in the carpus. In the present instance the limb, when sent, had been disarticulated between the two rows of bones. I did not, however, observe any extra carpal bones.

All the three specimens of atavistic polydactyly in the Museum now belong to the off fore limb. Surely a strange coincidence.

The near fore limb is a good example of a supernumerary digit arising by a splitting of parts. The splint bones and the large metacarpal are normal; the proximal phalanx is also normal as far as its middle part; here, however, it divides into two branches, each of which carries the remainder of a digit surmounted by a hoof. The distal extremity of the os suffraginis has thus two articular surfaces separated by a groove; these articular surfaces are rounded and much smaller than the surfaces of the opposing bones. The external branch is the longer. The two ossa coronæ are irregular bones, each having a comparatively large articular surface at their superior extremities, and undulating ones at their inferior extremities.

The internal surface of the external bone, and the external surface of the internal bone are somewhat flattened, and these two surfaces were in the fresh state connected together by an interdigital ligament. The two pedal bones very much resemble what a normal os pedis would do, if cut into two halves in a vertical direction. The facets for the navicular bones are wanting, and there is only one plantar foramen in each bone. The two hoofs were joined together by a horny union at their superior parts, and were very similar to an ordinary hoof which had been slightly compressed in a lateral direction. For the illustration, Plate I., I am indebted to Dr. James Hunter, F.R.S.E.

References.

Cossar Ewart.—*Development of the Skeleton of the Limbs of the Horse.*
Clark.—*Horses' Teeth.*
Journal of Anatomy and Physiology, vol. xxx., Polydactylism.—Gregg Wilson.
Veterinary Record, June 1901, Supernumerary Digits.—Parker.
Journal of Comparative Pathology and Therapeutics, 1896, Supernumerary Digits.—Goodal.
Manual of Palæontology—Perissodactyla.—Nicholson.
Veterinary Journal, 1889—Monsters.—O. C. Bradley.

THE COMMUNICABILITY OF HUMAN TUBERCULOSIS TO CATTLE.

BY SHERIDAN DELÉPINE, PROCTOR PROFESSOR OF PATHOLOGY, OWEN'S COLLEGE, MANCHESTER.

[PRELIMINARY COMMUNICATION.]

(*Continued from page* 313.)

THIRD CALF.

Brown and white bull calf (No. 1188), about six weeks old, apparently healthy. On August 1st this calf was given 50 c.cm. of mixed tuberculous sputum thoroughly stirred with two quarts of sterilised milk. Two weeks after the animal began to look ill. On August 22nd fœtid diarrhœa with much flatulency set in. The animal, however, continued to take its food well. On August 26th it received an injection of tuberculin, but unfor-

tunately died during the night, so that it was impossible to ascertain whether the animal reacted or not. As the animal did not seem to be very ill, and the dose of tuberculin was only 10 minims, there was no reason to expect a fatal termination.

The post-mortem examination revealed the following lesions: Peritonitis with fœtid semipurulent exudation in the peritoneum. Enlargement and softening of all the mesenteric glands, more especially of the chain of glands along the intestinal border of the mesentery. In addition to these, the following lymphatic ganglia connected with the alimentary canal were enlarged, softened, and more or less congested: pharyngeal glands, long and short œsophageal glands, some of the mesenteric glands at the root of the mesentery, and three lymphatic ganglia in the mesorectum. There was a small patch of hæmorrhagic consolidation at the apex of the right lung; the spleen was apparently normal and the liver mottled owing to early necrotic parenchymatous changes. Among the lymphatic ganglia some presented special appearances in addition to those mentioned above, the left pharyngeal was much congested and presented some necrotic areas. The œsophageal glands were firmer than the others, and also presented rounded patches such as are found in glands affected with early tuberculous lymphadenitis. The rectal glands were in the same state.

All the lymphatic ganglia mentioned above have been examined microscopically, but so far tubercle bacilli have not been discovered in any by that method.

Guinea-pigs (Nos. 1193, 1194, 1195, 1196) were inoculated with the pharyngeal, œsophageal, ileo-cæcal, and rectal lymphatic ganglia respectively. Of these the one inoculated with ileo-cæcal gland died rapidly; those inoculated with the pharyngeal and rectal glands do not show yet any external evidence of disease. The guinea-pig inoculated with the œsophageal gland began to show external evidences of tuberculosis before the end of the first month, and died forty-six days after inoculation. The post-mortem examination showed that all the lymphatic ganglia, with the exception of the cubital and right popliteal were tuberculous; the ganglia directly connected with the seat of inoculation being much more diseased than any of the others. The liver and the spleen were of a very large size, and their tissue almost entirely replaced by extensive tuberculous lesions. Tubercle bacilli were present in large numbers in the lymphatic gland.

This case is of considerable interest. The calf died twenty-six days after being fed on milk containing 50 ounces of human tuberculous sputum, no other source of tuberculous infection having been allowed after that feeding. The cause of death was obviously not tuberculous infection; the bacillus which had caused the death of the first two calves was probably the chief cause of the changes found in the lymphatic ganglia connected with the intestine. It must be surmised that the injections of tuberculin brought about the death of the animal by causing a sudden rise of temperature; of this, however, there is no absolute proof, since the animal died during the night, less than eight hours after the injection, and there was no opportunity to take the temperature again before death. The state of the glands made it difficult to discover tubercle bacilli in any of them by microscopical examination; but of the guinea-pigs inoculated with various glands, one died of advanced tuberculosis due to the inoculation. As there was in the calf no evidence of tuberculosis in any other organ than the lymphatic ganglia connected with the alimentary canal, and more especially those

connected with the pharynx and œsophagus, and as the age of the lesions indicates a very recent infection, this case creates a strong probability that the tuberculosis of these glands had been caused by the ingestion of the tuberculous sputum.

FOURTH CALF.

Strawberry roan heifer (No. 1186) under four weeks of age. On August 1st this animal was inoculated with 5 c.cm. of mixed tuberculous sputa. Sputum injected into the peritoneal cavity. A marked swelling of the right precrural gland (situated about 4 inches from the track of the inoculation needle) was observed three weeks later. The temperature was very irregular, varying from one day to another from 102° to 105° F.; it was usually between 103° and 104° F.

On August 26th, the temperature showing no tendency to become regular, the animal was nevertheless tested with tuberculin; a rise of 1° F. only was observed at the end of twelve hours. As this rise was less than rises observed before and after the injection of tuberculin, it could not be considered as evidence of even a doubtful reaction. It must, however, be noted that the precrural gland, which was already enlarged, increased considerably in size, and became tender the day after the tuberculin injection. Afterwards it resumed its previous size, and gradually became smaller, but remained still larger than the corresponding gland on the other side of the body. After September 18th the temperature became more regular, oscillating between 103° F. and 103·8° F. On October 2nd it fell still further down, ranging between 102·4° and 102·8°. On October 8th 15 minims of tuberculin were injected; this was followed by a sharp reaction, the temperature rising to 106·2° F. after eight hours. (It is even possible that the temperature had been higher before that time.) It fell slowly to 103·8° F. in twenty-four hours.

Three days after, I had the animal slaughtered at the Manchester abattoir, where I made the post-mortem examination.

The chief lesions found were the following:—

Abdomen.—The right precrural gland was about twice as large as the left, and more rounded. No typical tubercle was visible. There were several cheesy tuberculous masses in the large omentum near the duodenal end of the stomach. There were numerous tubercles in the pelvic peritoneum; small miliary tubercles in the suspensory ligament of the liver. The parietal peritoneum behind, and the diaphragmatic above, the spleen, also the parietal peritoneum in both iliac regions, was thickened, rough, covered with small fleshy tuberculous-looking nodules and small polypoid masses (young grapes). Parietal and visceral peritoneum generally roughened. Two of the sacro-iliac lymphatic ganglia were very much enlarged, but not necrosed. Several mesenteric ganglia were slightly enlarged and firm, but showing no distinct tuberculous lesions. The retrohepatic ganglion much enlarged, and with several necrotic patches. A few tubercles were present in the capsule of the liver at the insertion of the falciform ligament, and a few miliary tubercles in the peritoneal covering of the spleen.

Thorax.—Along the line of attachment of the diaphragm to the thoracic wall the pleura was covered with small fleshy tuberculous masses, causing in some places a considerable thickening of the costal and diaphragmatic pleura; these were most abundant over the spleen, in the neighbourhood

of which the peritoneum was also most affected. Rows of small tubercles were also found along the lymphatics in the intercostal spaces up to the sixth or fifth rib; above that level only a few tubercles were found in the pleura. The pulmonary pleura was nearly normal, and the lungs were entirely free from any lesion visible to the naked eye. The pericardium was slightly affected, but round the large vessels at the root of the heart it was almost entirely covered with a layer of small rounded, fleshy tubercles. The bronchial glands were slightly enlarged, but showed no other evidence of tuberculosis. The suprasternal ganglia were enlarged, congested, and more affected than any other thoracic ganglia, but there were only a few slightly opaque lesions indicating the probable presence of tuberculous lesions.

Bacilli.—Tubercle bacilli were found on microscopical examination in the omental tubercles and the retrohepatic ganglion; none have so far been discovered in the mesenteric, œsophageal, and bronchial ganglia.

Inoculation of Guinea-pigs.—Guinea-pigs have been inoculated with several of the lesions. At the end of nine days they all showed evidences of beginning tuberculous infection. This experiment can leave no doubt as to the source of infection. All the lesions are clearly connected with peritoneal infection. They have the same distribution as those found in rabbits and guinea-pigs inoculated intraperitoneally with tuberculous products of human or bovine origin. I have in many hundred experiments obtained practically identical results with bovine and human tuberculous products injected into the peritoneum of guinea-pigs and rabbits, the focalisation of the tuberculous lesion in the pelvic and diaphragmatic regions, the gradual invasion of the pleura through the diaphragmatic lymphatics, the extensive lesions in the omentum and comparative escape of the mesenteric ganglia, are all characteristic features of peritoneal infection. The entire absence of old tuberculous lesions, the incompleteness or absence of tuberculin reaction three weeks after inoculation, replaced by a clear tuberculin reaction six weeks later, clearly connect the lesions observed with the inoculation of human tuberculous sputum on August 1st.

There was no evidence of any tendency to resolution in any of the lesions. They were all young and in a progressive state; Mr. Holburn, the Manchester Chief Veterinary Inspector, who was present and assisted me, was able to satisfy himself that the tuberculous lesions were typical and had exactly the distribution which, previous to exposing the organs, I had mentioned to him as likely to be found on the supposition that the sputum injected had carried tuberculous infection to the calf.

(*N.B.*—The first set of experiments had only for its object to determine whether human tuberculous products are injurious to cattle or not; further experiments are being arranged for with the view of determining the conditions which influence the virulence of human bacilli for cattle and the proportion of recoveries after such infection. The author takes this opportunity of acknowledging the facilities which have been this month offered to him by the Manchester Sanitary Committee for the prosecution of more extended experiments. Very soon after the beginning of this investigation, Dr. A. Hodgkinson also generously offered to bear the cost of experiments conducted on a farm belonging to him.)

ROYAL VETERINARY COLLEGE, LONDON.

INTRODUCTORY ADDRESS (SESSION 1901-1902).

BY EDGAR M. CROOKSHANK, M.B., PROFESSOR OF COMPARATIVE PATHOLOGY AND BACTERIOLOGY, FELLOW OF KING'S COLLEGE, LONDON.

(*Continued from page* 286.)

To eradicate tuberculosis in cattle, and so to ensure the breeding of perfectly healthy stock, and thus to restore the confidence of the public in the supply of wholesome meat and milk, will be a splendid work for veterinary surgeons to undertake, and one to which they must direct all their energies. As regards the prevention of tuberculosis in man, that must be left principally to the sanitary inspector and the medical officer of health. We must not concentrate all our energies upon the destruction of tubercle bacilli, but rather give more attention to other factors responsible for the causation of tuberculosis. The study of tuberculosis in animals may throw some light on these causes, and experience of the disease in man may assist in elucidating the causes of disease in animals. Tuberculosis is peculiarly liable to occur among birds and animals kept in captivity. Poultry and guinea-fowls are often the subjects of this disease, and ostriches and other birds in the Zoological Gardens become infected. In monkeys in captivity the disease occasionally occurs in an epidemic form. Pheasants in preserves were attacked sometimes in large numbers, and rabbits in overcrowded warrens. These instances help to illustrate the view that damp and other insanitary conditions, confinement, overcrowding, defective ventilation, heredity, breeding in-and-in, were the most powerful factors in rendering the tissues prone to tubercle and a fitting soil for the invasion of the bacilli. We must not omit in the case of man the influence of alcoholism which has been so closely investigated by Dr. Brouardel, the influence of previous illnesses such as measles and whooping-cough as urged by Dr. Goodhart, and lastly, the influence of special trade occupations which involve inhalation of dust of various kinds.

There are two points which I will discuss at greater length, heredity and tuberculosis in children. Heredity is of two kinds; there is hereditary predisposition to the disease, and hereditary transmission of the virus. There is an inherited susceptibility or weakness which renders many individuals liable to the development of tubercular disease. Family history plays a very important part in human tuberculosis. Sir Douglas Powell states from his experience that 48 per cent. of these cases in hospital suffering from tuberculosis had a previous history of hereditary tuberculosis. Whether all these cases are cases of hereditary predisposition, or hereditary transmission of the virus, or examples of both, is not determined. I am entirely in agreement with Dr. Klein and Professor Horsley that in some cases there is direct transmission of the virus, and that it may exist for many years in a latent form. Dr. Klein brought this matter very convincingly before the Royal Commission. In connection with this question of heredity some interesting observations upon tuberculosis in birds have been recorded by Dr. Baumgarten. On a poultry farm a cock developed tuberculosis. All the chickens reared from this cock were tuberculous. There was no evidence that the fowls were infected with either human or

bovine tubercular virus. An identical case occurred on another farm, and these cases have been accepted as evidence of the direct transmission of the virus from the parent bird. Tuberculosis is a rare disease in calves. It seems probable that those cases which do occasionally occur are mostly, if not entirely, the result of hereditary transmission. In discussing the occurrence of tuberculosis in children we may derive some consolation from the immunity of calves. Tuberculosis in children is largely a disease of the poor. It attacks all classes, but is extremely common among the London poor and the poor of our overcrowded cities. I would attribute the disease in children to a want of milk rather than the possible occurrence of a few stray bovine bacilli in milk. Plenty of milk, good nourishing food, and better hygienic surroundings will do more to diminish the numbers of tuberculous children than any legislation directed against bovine bacilli. In proportion as the slums are removed from our overcrowded cities, and the problem of the better housing of the poor has been solved, we may expect to see a steady diminution in the amount of tuberculosis in children. I believe that the infectious nature of the disease has been exaggerated. It is quite possible that the theory is fallacious. I mean the idea that phthisis can be caught like scarlet fever, or may be compared to typhoid fever, is, I think, a mistake. In typhoid fever epidemics at home, in India, and in South Africa, we know that, apart from cases of individual insusceptibility, we have not to consider any other factors except the introduction of the specific poison of typhoid fever. Those in health and out of health form victims to the disease if they have taken the poison in water or food. There is no question at all of hereditary transmission or of predisposing conditions which render the subject susceptible to the poison. At the same time the habit of spitting in public places and railway carriages and other conveyances should be prohibited, and the sputum of phthisical persons should be disinfected. Several years ago I carried out experiments proving that sputum treated with 20 per cent. carbolic acid was rendered quite inert. Guinea-pigs inoculated with the carbolised sputum remained perfectly healthy, and all control animals were infected without exception. There is no need to create a panic or raise an outcry for legislation to make spitting in public places a matter to be dealt with in the Police Court. That the virus of tubercle scattered far and wide becomes a constant source of danger to all who inhale the air is not a theory which is supported by experiment and experience. Dr. Ransome maintains that in a well-ventilated room it is rendered harmless. Tubercular sputum was exposed in the ventilating shaft of a hospital and proved virulent to rodents, but similar sputum exposed for the same time in Dr. Ransome's room, which was ventilated and well lighted, was absolutely harmless.

Dr. Klein placed a number of guinea-pigs in cages in the ventilating shaft of the Brompton Hospital very many years ago. They were kept there for several weeks and all of them became tuberculous. We must not too hastily draw conclusions upon small animals such as rodents. In the same institution it was found among all those who had been connected with it—nurses, porters, physicians, surgeons, and so on—the mortality from consumption was quite within the average of ordinary mortality. I am convinced that if tuberculosis were readily conveyed from person to person, that marriage of individuals who become or are consumptive would be a fruitful source of direct infection. We should hear constantly of instances in which married people had infected each other with tuberculosis owing

to the opportunities which occur for conveying the disease by the breath and in other ways. It is necessary to lay great stress upon the difference between experimental inoculation and natural infection. I cannot therefore regard tuberculosis as catching in the same sense that scarlet fever is catching, nor can I regard the comparison to typhoid fever as one that is not very misleading. Those who aim at eliminating the conditions which I have referred to as powerful factors in the production of tuberculosis will render the greatest services in the crusade against tuberculosis in animals as well as in man. I trust that many of you present to-day will assist in this great work.

The CHAIRMAN (Mr. ALBERT BRASSEY).—I am sure it is your wish that we should all express our cordial thanks to Professor Crookshank for the exceedingly eloquent and interesting address which you have just heard.—(Cheers.) I am sure he has indicated a very large scope of study for all of you who belong to this College, and I am quite sure it is a great source of congratulation to the College that your Principal has been elected on this forthcoming Commission.—(Cheers.) It is not only a great honour to himself, but it is also a great honour to your College here. I fully endorse all which Mr. Crookshank said at the commencement of his address, of the great importance that we should have skilled veterinary surgeons throughout the country. I am quite sure that no one in this theatre who is a student will find that the time which he spends in this College is wasted time or time thrown away. I only wish that I had had more time and had been a student here, because for a great number of years I have been a master of hounds—(cheers)—and have had a large stud of horses which have cost me a great deal of anxiety from time to time. Some years ago, I may tell you, I was on a yachting cruise in Iceland. There is not a daily post there, and I could not frequently get news from home. When I came back in the last week of August I was informed that fifteen of my horses were laid up with influenza. I am sure that that was not a very enviable position for a master of hounds to be in.—(Hear, hear.) What did I do? I immediately applied to the Veterinary College and a Professor was sent down, and I am quite sure it was entirely due to his treatment that the horses got over the disease as well as they did.—(Cheers.) I am also indebted to the College not only with regard to the horses, but with regard to the hounds also, for a year or two ago we had a disease amongst them. A veterinary here kindly took charge of a couple of the hounds and brought them round all right. The treatment which was adopted, I am sure, resulted in our having no very bad cases. All the hounds recovered after a time. But this only shows how very important it is that everybody who has an interest in animals, whether he be a farmer or a master of hounds, or a cavalry officer, should have a little veterinary skill. In conclusion I hope that you will all devote your energies to make yourselves masters of the profession, and that you will be successful in after life. I have great pleasure in moving a vote of thanks to Professor Crookshank for his eloquent address.—(Cheers.)

Carried by acclamation.

Professor CROOKSHANK.—Mr. Brassey and Gentlemen, I thank you very much for this cordial vote of thanks. It has been for many years, and I hope it will be for many years to come, my privilege to do what I can for the Royal Veterinary College.—(Cheers.) I am afraid I have treated our new students to-day to some of the dry dust of pathology. I would now like to say one word to them in rather a different vein. I have come down from

my temporary home in Scotland to deliver my address to you to-day, and I should like to relate to you a little incident which occurred during my stay there. I was fishing in a loch which is very famous for its sea trout and salmon, and having a very favourable day I anticipated great sport. I whipped that loch the whole morning with one or two very unsatisfactory rises, and, I must confess, I became somewhat disheartened. I turned to my old gillie and said, "Donald, what is the secret of catching fish on this loch?" "Well," he said, "it is just this way, you never know when the fish are going to rise; they may rise half-an-hour in the morning, or they may rise in the middle of the day, and sometimes it may not be until the evening. But there is only one way of catching fish, and that is by sticking to it." Well, I took his advice, and a little later in the afternoon the atmospheric conditions were more favourable, a breeze came up, and I secured a salmon. After that there were two or three large trout, and then a 3-pound sea trout, and afterwards three or four more of about the same size. Now, I have a moral to my story. I looked at these beautiful fish at the bottom of the boat, and I suppose I had rather the air of self-satisfaction. I also handled my little split cane trout-rod with feelings akin to affection. I think my old gillie must have read my feelings, because he said, "The real secret, you see, is sticking to it." (Hear, hear.) Well, gentlemen, I hope that the new students who have joined to-day will carry out that admirable advice of the old gillie Donald, and that in the College, and in their career in after life, you and they will have success by "sticking to it." (Cheers.) Do not get disheartened, as I admit I was at first. Your opportunity in life is certain to come. Then take your opportunity and stick to the work you have in hand. Follow it carefully, keep your eye on your work as you would keep it on your fish, do not get slack—do not keep a slack line, as the gillies say; but bring all your experience and observation to bear on the object which you have in view. and then I am certain you will not only land your fish, but you will succeed in life. (Loud cheers.)

The CHAIRMAN then called upon the Principal of the College, Professor M'Fadyean, to read the list of prizes gained during the session.

Professor M'FADYEAN.—I have great pleasure in reading out the names of those who have been successful in winning the principal prizes awarded as the result of the competitions which were held during the past session. In the first place there are the Coleman Prizes, which are awarded as the result of examinations relating to glanders, diseases of the eye, and diseases of the foot. The first prize is a silver medal, which has been won by Mr. F. W. Robards; the second, bronze medal, Mr. E. C. Webb; and certificate of merit, Mr. S. F. G. Pallin.

Centenary Prizes.—Class A., E. Brown; Class B., A. S. Leese; Class C., J. Craig; Class D., F. W. Robards.

Royal Agricultural Society's Medals.—Silver Medal, J. Harrison; bronze medal, F. W. Robards.

Clinical Prizes.—Class A. 1st Prize £5, J. R. Hodgkins; 2nd Prize £3, D. Quinlan; 3rd Prize £2, F. V. Steward. Class B., 1st Prize £5, T. Hewson; 2nd, £3, H. Mason; 3rd, £2, G. G. Brown. Class C., 1st Prize £5, G. Sutton; 2nd, £3, H. E. Gibbs; 3rd, £2, H. B. Hiles. Class D., 1st Prize £5, E. M. Perry; 2nd, £3, J. Adamson; 3rd, £2, F. Hopkin.

Class Prizes.—Class D.—Veterinary Medicine.—1st Prize, F. W. Robards; 2nd Prize, J. Harrison. Surgery.—1st, F. W. Robards and E. C. Webb; 2nd, G. S. Bruce. Class C.—Pathology.—1st, J. F. Craig;

2nd, G. P. Male. Hygiene.—1st, G. P. Male; 2nd, S. Dodd. Materia Medica.—1st, C. W. Townsend; 2nd, H. E. Gibbs. Class B.—Anatomy.—1st, A. S. Leese; 2nd, H. Mason. Physiology.—1st, A. S. Leese; 2nd, J. C. Broad. Histology.—1st, E. O'Reilly; 2nd, A. N. Foster. Class A.—Chemistry and Toxicology.—1st, E. Brown; 2nd, T. C. Graves. Practical Chemistry.—1st, T. C. Graves; 2nd, W. Urquhart. Biology.—1st, T. C. Graves; 2nd, E. Brown. Minor Anatomy.—1st, E. Brown; 2nd, T. C. Graves.

Gentlemen, the Chairman called upon me only to read out the prize list, and I daresay you would have been glad if I had confined myself to that. ("No, no.") However, I am going to do something more. (Cheers.) It is simply to say that Mr. Crookshank, to whom we are so very much indebted, has saved me the trouble of offering you any good advice or pointing out how success is to be attained on the result of the class competitions—which are of comparatively trifling importance—and in your career in after life. I am only going to put the advice which he gave in a very slightly different form. I occasionally have fished for salmon and sea trout—(laughter and cheers)—and I remember very well, when I was getting my elementary instruction in that very interesting art I used to ask everybody from whom I thought I could learn anything as to what was the best way to catch salmon and sea trout, and the answer which I usually got was that the best way was to "keep the fly on the water." (Cheers.) I think that is strictly applicable to your course of study here; in other words, you must be diligent throughout the whole course, and you must begin immediately. Finally, I want to say that you will all be expected to begin to-morrow, not as if it were the second day of the session, but just the same as if it were the fiftieth day, or the day before the examination. The lectures will begin at nine o'clock, and I hope dissection will begin at ten.

Sir GEORGE BROWN.—Gentlemen, I have a very easy and short task which will enable me to finish the interesting work of to-day. We have for Chairman Mr. Albert Brassey, M.P., who has kindly conducted this meeting to your satisfaction I have not the slightest doubt. (Cheers.) It is an encouraging sign in the veterinary profession that there should be so many gentlemen in different walks of life,—soldiers, sailors, members of the legal profession, M.P.'s, and Masters of Hounds on your Board, who do not scruple to devote their time not only to occasional attendance here for the purpose of filling the chair, but as hard-working members on the Board. (Cheers.) I am perfectly certain that you will pass this vote of thanks to Mr. Brassey in your usual emphatic manner.

The vote was carried with acclamation.

The CHAIRMAN.—Sir George Brown and Gentlemen, I am sure it has given me the greatest possible pleasure to come here to-day and to receive such a hearty welcome. With regard to doing anything as one of the Governors or in any other capacity on behalf of this College, I am only too glad to render all the service I can. I have said before how important it is to have good veterinary surgeons throughout the country, and I cannot do more than hope that you will all act upon the very excellent advice which you have had from gentlemen on my right and on my left. I hope you will stick to it. I am quite sure that if you do, it will stick to you. No doubt there is a very great demand not only in this country but in the Colonies, and especially in the army, for skilled veterinary surgeons. I wish you one and all every success in your future lives.—(Loud cheers.)

REMINISCENCES OF THE SOUTH AFRICAN CAMPAIGN.[1]

BY C. CUMMINS CHERRY, G.M.V.C.

"TIME flies" is a very old adage. February last twelve months hardly seems but a few months ago, when I was initiated into camp life at Kensington, N.S.W., on one of its characteristic dusty days, which we were treated to only too often.

With 600 horses in camp, and at least 75 per cent. to be shod on fore feet within a fortnight, one can surmise there was a busy time in store for the veterinary surgeon. For a fortnight we had a busy time on the sick lines. The dressers attended well to the innumerable and multifarious wounds—the heel-ropes being responsible for a goodly number—which made rapid progress in the "open-air life." Naturally, with so many horses in camp, there were colic cases in abundance, which, with immediate treatment, made rapid recovery. There were several cases of strangles, but by taking ordinary precautionary measures an enzootic was doubtless prevented.

The major surgical cases were few. One horse received a nasty stake, fracturing the two first near ribs. After removal of several large pieces of wood, the horse made a rapid recovery.

On the 28th February we were on board the "Atlantian," having embarked our horses in record time. In another four days we were at Hobart, ready to take on the wily Tasmanian Bushmen and horses. While quiescent here we were soon cognisant of the ventilating capacity of our transport, the vitiating atmosphere in one of the obscure corners providing a few cases, which was repeated when quiescent in other places—Cape Town and Beira.

On the 31st March 1900 we were anchored at Table Bay, having experienced rough weather for some time, and a continuous monotonous roll.

The horses gave us a considerable amount of trouble, there being innumerable cases of colic, a few of pneumonia, and a case of tetanus (successfully treated by jugular phlebotomy), and stomach staggers, while almost every horse was suffering from catarrh. *En route* to Cape Town the horses were fed according to the Imperial regulations, being allowed a goodly supply of oats, bran, chaff, and hay.

At Cape Town our horses looked admirable, the officials there being particularly pleased with them. After waiting a few days in Table Bay, we received orders to proceed to Beira, another seven days' trip, necessitating our taking in fresh forage, unfortunately not of the best kind. On the forty-second day on the water we were disembarking our horses at Beira, not by any means in the same condition they were at Cape Town. From thence on brings back memories too cruel. The arrangements for entraining horses to Marandellas, Rhodesia, were diabolical.

Bamboo Creek, Portuguese East Africa, is absolutely the worst region of horse-sickness in Africa. We first witnessed a virulent outbreak of horse-sickness amongst some 400 mules in this locality, and not long after were witnessing horses that we had taken so much trouble with succumbing to the same vile disease.

We were now also in the tsetse fly region, and found all horse-trucks

[1] From the *Australasian Veterinary Journal*, August 1901.

made fly-proof. From what I could gather from the professional hunters, the fly always accompanies the buffalo, which, owing to the traffic of late, had gone "in country" for some distance. "It never rains but it pours." While waiting at Marandellas for the different drafts of the regiment to arrive, we discovered yet another disease amongst our horses—the so-called blue tongue.

En route to Buluwayo, some three hundred miles trek, there was no trouble in locating the different camping grounds—the stench of dead horses told us too well. What with the cry of the jackals and the coldness of the night, our sleep was not too long and pleasant, as we were on the move at half-past two o'clock in the morning—the best time, the Cape colonials tell us, to travel oxen. Whilst speaking of oxen, one was impressed with the enormous horns of certain breeds. The Boers in emergency seem to make use of any member of the bovine tribe. It is not uncommon to see his span consisting of heifers, milch cows, and bulls. Both they and the Cape boys are not particular from which side they drive their span, while their whips are considerably larger than those used in Australia. Throughout the trek we found the country infested with ticks and, concomitant, several cases of hæmoglobinuria.

On my arrival at Buluwayo I found the horses that had preceded me in a very poor and anæmic condition, the ticks being worse in this region than elsewhere. By prohibiting grazing and using the only material available—Cooper's sheep dip—for destroying the ticks, the horses soon put on condition, and were sent down to Mafeking in drafts. On the arrival of other veterinary surgeons I was afforded an opportunity of rejoining my regiment at the front—Otto's Hoop, Western Transvaal. Here I hadn't long to wait to see active operations. My first impression was the aseptic and small wound made by the Mauser bullet. One is not called upon to extract bullets as often as one would think. In the cases I was generally called upon as such the bullets had generally passed through one limb into another, the force being expended in passing through the second limb. Where the points of entrance and exit were visible, the wound was left in charge of nature, as one will agree that probing a wound would only tend to make it septic. In cases of stiffness a mild liniment was prescribed, and the animal in a few days was generally at work again.

In my first few weeks at the front we had several cases of glanders, while a little later on several cases of what the Cape colonials call mule-sickness,—really a malignant catarrh.

The poorly stuffed saddles were playing havoc with the horses' backs. The rapid abscess formation was marvellous. The Bushmen call them "kopjes." We were fortunate in procuring some Indian cavalry saddles, which are of the panel type, and do not rest on the horse's spine, thus being able to work some of our horses that were previously useless for the time being. Of the interesting cases, one was luxation of the third and fourth cervical vertebræ, the horse by some means having been cast in a tree. On a hasty examination I failed to find any fracture, while the luxation was easily reduced, but difficult to keep *in situ*.

When after the Boers at Schweizer Reneke we were compelled to swim a drift, the Hartz River being in flood at the time. An officer of the R.A. was riding a fine upstanding roarer bearing a tracheotomy tube. The unnatural orifice nearly caused the poor brute its life, having had a narrow escape from drowning.

Our oxen gave us little trouble. There were a few outbreaks of pleuro-pneumonia, termed "lung sickness" in Africa. The infected spans were inoculated the first opportunity.

On touching the lines of communication we were generally supplied with remounts. These we found a very indifferent lot; but no matter how good a horse may be, it cannot be said he gets fair play. Rushed off the boat into trucks, thence cooped up in a small remount camp, where he cannot exercise his limbs freely. I remember well on one occasion one lot of remounts had to travel 20 miles direct. These horses, I dare say, had never walked more than half-a-mile at a time before for months. I know that out of one lot of sixty for the Australians, at least one dozen were under treatment the next day for acute laminitis. Then, again, take the weight these horses are carrying. The Australians on the average, without exaggeration, were riding at least fifteen stone. Take the distance of the average trek into consideration, 15 miles, with very often a 7 or 8-mile gallop; then consider the care and feed they receive, and compare the horse's life in Africa with the average hunter of Australia. Isn't it marvellous the work they do? Can one wonder why there is such a demand for fresh remounts?

Since my return I have often heard it remarked "that a horse couldn't receive beneficial treatment while trekking." Well, from experience, I have no hesitation in refuting that statement. My memory recalls many instances of horses, after receiving a good stimulant or sedative drench, resume trekking in good heart the next morning, to the great but acceptable surprise of the owner. Our systematic "sick parades" were an index of our therapeutic work. Many a sick horse, were it not for the timely interference of the veterinary surgeon, would have been ridden cruelly, though ignorantly, to death.

The outbreak of that contagious and infectious disease, glanders, both on board our transports and at the active seats of the war, alone necessitated the keenest vigilance of the profession. There is no doubt that had glanders had its sway the vile disease would have simply decimated our horses, and thus considerably hampered the progress of the campaign.

We presume that the honours conferred upon the head of the Army Veterinary Department are a practical acknowledgment of the indebtedness to the profession.

THE NATURE, CAUSE, AND ECONOMIC IMPORTANCE OF OVINE CASEOUS LYMPH-ADENITIS.[1]

BY VICTOR A. NÖRGAARD, V.S., (COPENHAGEN), CHIEF OF PATHOLOGICAL DIVISION, BUREAU OF ANIMAL INDUSTRY, AND JOHN R. MOHLER, V.M.D., ACTING ASSISTANT CHIEF OF PATHOLOGICAL DIVISION, BUREAU OF ANIMAL INDUSTRY.

INTRODUCTION.

DURING the years 1897 and 1898 a number of specimens of degenerated lymph glands, taken from sheep at the registered abattoirs by inspectors of this Bureau, were forwarded to the Washington office, with a request for detailed information regarding the lesions. The first specimen came in June 1897 from Dr. O. B. Hess, stationed at Los Angeles, Cal., who wrote

[1] From U.S. Department of Agriculture's Sixteenth Annual Report of the Bureau of Animal Industry for the year 1899.

as follows:—"I find a condition in sheep, in which the prescapular, the external inguinal, the mediastinal, and the tracheal glands are enlarged in some instances to four times their normal size, the structures in question containing a caseous material. Occasionally the lung tissue is also involved, but without any inflammation. The affected sheep are in good condition, and may even be fat. Thus far I have never observed these lesions in lambs, but only in sheep from two to three years old."

It was stated further that this condition was observed only in sheep from Southern California, whilst animals shipped to Los Angeles from Arizona were not affected. As the specimens thus sent had been shipped a long distance in midsummer, they could not be studied bacteriologically. Later, similar specimens were forwarded by other inspectors, notably by those stationed in Chicago, Omaha, and Kansas City. The post-mortem notes accompanying the material seemed to indicate that the animals from which the glands had been taken were usually in good condition otherwise, and that in the majority of cases they "dressed out" well, and the carcases were passed as suitable for food. Only in the case of older animals, especially old ewes, with extensive lesions, did there appear a marked degree of emaciation. The increased number of specimens submitted for examination indicated that the economic importance of the disease in question demanded a more than casual study of the subject, and led to an investigation relative to the nature, cause, and prevalence of the disease by the authors of the present paper.

The lesions were determined without difficulty as identical with those observed in sheep by Preisz and Guinard in 1891. They inoculated guinea pigs and rabbits with fresh material from an affected sheep, and observed as a result a series of pathological lesions which bore a close resemblance to those of tuberculosis; but, instead of Koch's *Bacillus tuberculosis*, they found a thin and very short bacillus with rounded ends. Owing to the character of the alterations it produced they named it *Bacillus pseudo-tuberculosis*. Since then other authors have observed the same bacillus in similar lesions, and their descriptions of its morphology and cultural characteristics have been at variance only in unimportant details.

The bacillus causing the lesions under discussion in the sheep of this country is in most respects identical with the one first observed by Preisz in 1891, and fully described by the same author in 1894.

Name of Disease.—Under the name of "Pseudo-tuberculosis" a number of diseases and pathological alterations have been described, the name in every instance being based upon the resemblance of the lesions to those of tuberculosis. On the other hand, the bacillus of Preisz has been obtained from a number of greatly varying pathological conditions in several species of the domesticated animals; and as the disease in sheep, which we are considering in this paper, is accompanied by characteristic pathological alterations of the lymphatic glands, we deem it expedient not to use the term pseudo-tuberculosis, but propose the new name "Caseous lymph-adenitis."

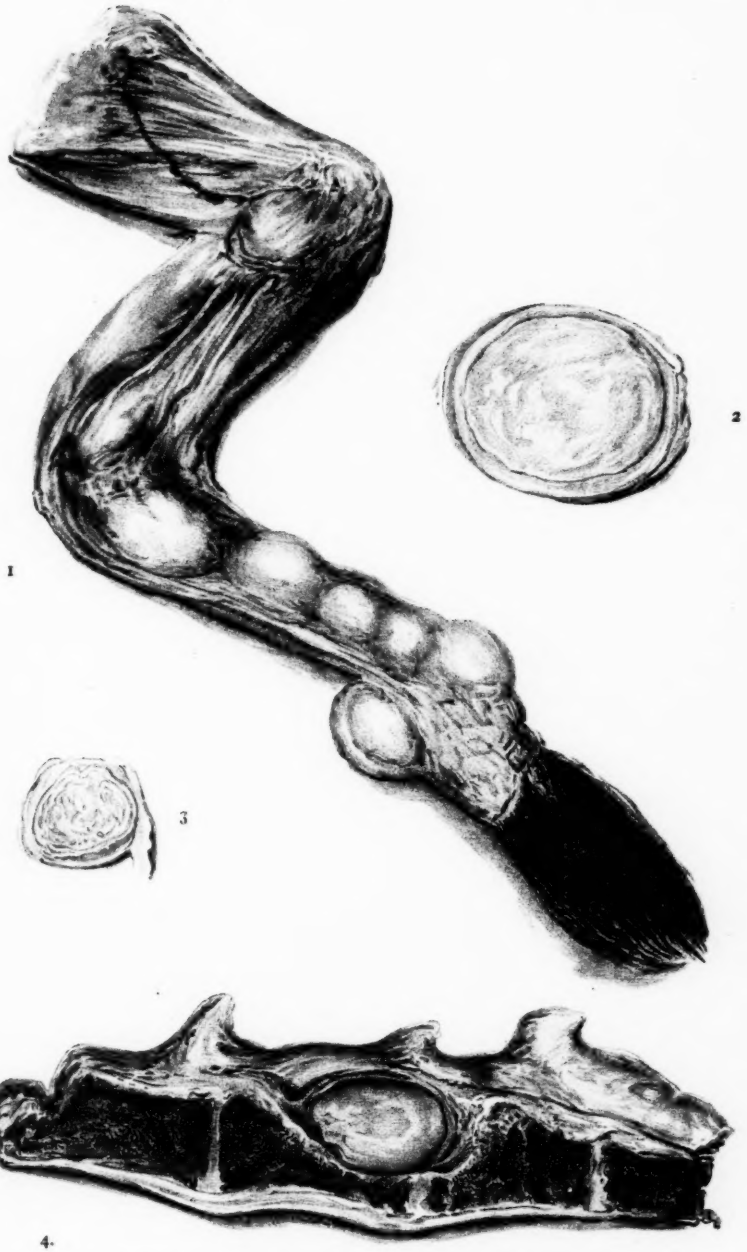
HISTORY AND GEOGRAPHICAL DISTRIBUTION.

Up to the present time caseous lymph-adenitis has not been recognised generally as one of the more common infectious diseases of sheep. Most of the modern text-books on veterinary pathology pay little or no attention

to it (Kitt, Schneidemuhl, Friedberger, and Fröhner), and it is, therefore, not surprising that the practitioner in general, and the meat inspector in particular, is unfamiliar with the true nature of this easily recognised and very characteristic disease. With the exception of Preisz and Guinard's one case, recorded in 1891, no publication on this disease in sheep appeared until 1894, when Preisz took up the question again, and devoted himself especially to the comparative pathology and differential diagnosis of the various lesions which at that time were classified under the heading of pseudo-tuberculosis. He also made a thorough investigation of the morphology, cultural characteristics, and pathogenesis of the bacillus, which has been named for him; for this purpose he used the same material (the kidney of a sheep killed in 1891), upon which he had previously written.

From that time until June 1895 no more cases were reported, although there can be little doubt that the disease must have been prevalent to a greater or less extent in some of the places where it has since been observed. At the above-mentioned period Turski published an article on an epizootic of pseudo-tuberculosis in sheep from West Prussia, which came to his notice while he was meat inspector at the abbatoir at Danzig. One hundred and fifty breeding ewes from eight to twelve years old, all originating on the same estate, were brought to the stock-yards and sold to a local butcher. Many of them were in very poor condition, and on ante-mortem inspection a number of them showed nodules, or abscesses, the size of a child's fist in the inguinal and prescapular regions. On post-mortem examination the bronchial and mediastinal glands of the affected animals were found to be much enlarged, and showed on section numerous foci containing greenish yellow caseous or grumous material. Some of the glands had the appearance of degenerated echinococcus cysts. The same condition was observed in the portal, the inguinal, and the precrural glands, some of which were entirely transformed into a homogeneous mass arranged in concentric layers, like the scales of an onion, and surrounded by a thick, fibrous sac. In no case were the mesenteric glands affected. The disease seemed to be confined to the lymphatic glands, and not even in those cases where the bronchial, mediastinal, or portal glands were involved could any trace of the lesions be found in either the lungs or the liver. A total of 44 animals out of 150, or nearly 30 per cent., were found to be more or less affected. The sheep were all pure-bred Merinos of the Electoral strain, and originated on an old estate (Rittergute) where inbreeding had been practised since 1825. The cases were diagnosed as pseudo-tuberculosis, and the bacillus of Preisz was found in all the lesions. A number of similar epizootics have been observed by the chief inspector of the public slaughter-houses in Gotha, Saxony.

In 1899 Cherry and Bull, of Melbourne, Australia, undertook to investigate a disease in sheep which, on post-mortem examination, were found to be affected with enlarged caseous lymph glands. They state that some of the flocks brought to the public abattoirs for slaughter are affected to the extent of from 15 to 70 per cent. The lesions observed are in every respect similar to those described above, but the animals most generally found affected are the wethers, while the lambs are practically exempt. The prescapular and superficial inguinal glands are most frequently affected, followed by the scrotal and the deep glands of the pelvis and the chest. In one or two cases out of many thousands examined they found similar lesions in the kidneys, but never in the mesenteric glands or liver. The



Lesions of Caseous Lymph-Adenitis in Rabbit and Sheep.

1. Inner aspect of the left fore leg of a rabbit inoculated intravenously, showing a chain of pearly white nodules along the course of the lymphatics.
2. Superficial inguinal lymph gland from a sheep with an idiopathic infection.
3. Prescapular lymph gland of a sheep similarly affected.
4. Suprasternal lymph gland of a sheep, causing atrophy of the sternum.

XUM

authors call the disease "caseous lymphatic glands in sheep, or pseudo-tuberculosis," and mention the bacillus of Priesz as the probable cause.

In the Argentine Republic a disease of sheep similar in most respects to that already mentioned has been described in a very able paper by Sivori under the name of caseous broncho-pneumonia in sheep. It is produced by the same bacillus described by Preisz, but it appears to have a greater affinity for the thoracic viscera. In this respect the conditions, as observed in the United States, seem to stand midway between those observed, on the one hand, in Germany and Australia, and, on the other, in the Argentine Republic. Sivori also finds that lambs are rarely affected, but that 10 per cent. of the older sheep killed at the abattoirs in Buenos Ayres show the typical lesions. These consist in enlarged caseous bronchial and mediastinal glands, with or without accompanying caseous broncho-pneumonia and adhesive pleurisy. The histological changes correspond to those observed here and in other countries, with the exception that calcification of the caseous material is commonly noted. He further states that the mesenteric glands are often affected, and that the liver is frequently studded with miliary or submiliary nodules, besides larger abscesses. The kidneys, as a rule, show one or more nodules, which, when located on the surface, may become very large. On the whole, the Argentine sheep seem to be more susceptible to the disease, as the lesions exhibited by them are more extensive, although the bacillus in question does not seem to be more virulent than the one investigated by us.

In the United States the disease seems, at the present time, to be rather common in certain Western districts. It was first reported from southern California in 1897—that is, soon after meat inspection was established there. It is not possible to determine how long it had existed there previous to that time, as the owners of flocks, as a rule, are ignorant of its presence; but judging from its prevalence in Europe, South America, and Australia, as well as to its wide spread in this country, it is not unreasonable to assume that the infection, which no doubt is of miasmatic nature, is of no recent origin.

SYMPTOMS.

In the majority of cases no symptoms of any importance are observed in the affected animals during life. The course of the disease is chronic, and the pathological changes develop so slowly as to cause no general or local interference with the well-being of the affected animals. This pertains especially to lambs and sheep which are bred and raised for mutton, and which are marketed before they are two years old. Only in breeding ewes and wethers does the disease advance to a degree which makes it clinically recognisable without the aid of manipulation.

When an inspector on the killing floor observes that a number of sheep out of a certain flock exhibit enlarged caseous lymph glands, and then proceeds to the yards and submits the flock in question to a thorough examination, he will find that a certain percentage of the young animals shows enlargement of one or more of the superficial glands, the precrural and the prescapular glands being most frequently affected. This enlargement can be noticed only by means of careful manipulation, for the animals thus affected seem in every other respect to be in perfect health. In the older animals—the wethers and breeding ewes—the same glands may be enlarged to a considerable degree, reaching the size of a hen's egg or even

larger, and some of these animals may show a certain degree of unthriftiness or even emaciation. The elder ewes especially seem to suffer the most, which is probably due to the fact that the wethers are generally disposed of before they are three years old, while a good breeding ewe is frequently retained for seven or eight years. In such old animals the superficial lymphatic glands may be enlarged to such a degree as to interfere with locomotion, while the deeper-seated glands and those in the body cavities are similarly affected. This condition, in connection with the loss of vitality caused by continued breeding and rearing of the offspring, reduces the original power of resistance of the system, and causes a dissemination of the disease by metastasis to the principal organs of the body. In such cases the disease may assume the appearance of chronic broncho-pneumonia or pleurisy, with symptoms of occasional cough, slight dyspnœa, and increasing emaciation and anæmia. The course of the disease is, however, exceedingly slow, and no fatal case has been observed by us, nor have we seen any recorded. It is, therefore, the rule that owners of affected flocks are totally ignorant of the presence of the disease, a fact which has made it very difficult to obtain reliable information regarding its prevalence. We have been obliged, therefore, to rely almost entirely on the statistics obtained from the slaughter-houses; and, as a majority of inspectors have classified the lesions either as tuberculosis or pyæmia or abscesses, it became necessary to ascertain just what conditions were covered by these terms. In response to inquiries it was found that the majority of cases condemned under these headings were in reality nothing but caseous lymph-adenitis. Several thousand cases are annually observed in the slaughter-houses of the United States, but only a fraction of these are advanced to a degree that would warrant the total condemnation of the carcase. All the inspectors with whom we have corresponded regarding this subject agree that lambs are very rarely affected, and that the progress of the pathological changes in the majority of cases is co-ordinate with the age of the animal.

PATHOLOGICAL ALTERATIONS.

As already indicated, the principal lesions are confined to the lymphatic glands. In many cases only a single gland is affected. The relative frequency with which the various ganglia become the seat of the lesions may be given as follows: Prescapular, precrural, superficial inguinal, bronchial, mediastinal, sublumbar, deep inguinal, and scrotal. In one sheep have we seen a suprasternal, and in another, one of the mesenteric glands affected. In the former case the gland was located beneath the pleura, and the constant pressure exerted by the enlarged gland had caused complete atrophy of the adjacent part of the sternum. Although the bronchial and the mediastinal glands are not infrequently affected, we have failed to obtain any evidence of an invasion of either the retropharyngeal or the submaxillary glands. Sivori mentions the mesenteric glands among those frequently affected, but in a detailed description of the post-mortem lesions of twelve typical cases of caseous broncho-pneumonia, caused by the bacillus of Preisz, he fails in every instance to mention the mesenteric glands as a seat of affection.

When first invaded by the bacillus, the adenoid tissue becomes hyperplastic, and the gland enlarges to several times its original size. On section the surface is found to be watery, but otherwise the tissue retains its

normal appearance. This is followed by the formation of various centres of degeneration which show concentric layers, and gradually become confluent. Finally the total volume of the gland is transformed into a homogeneous caseous mass. At the same time the distended capsule increases in thickness and forms a solid sac, which keeps the semifluid grumous mass confined within its bounds. In rare instances does the sac rupture, and when close to the surface the contents will be discharged in a manner similar to the discharge of the contents of an ordinary abscess. We have had no occasion to observe the result of rupture of any of the deep glands, but it is to be presumed that when it occurs it will cause pathological alterations similar to those resulting from the experimental inoculation of an excessive dose of virulent material. Under ordinary circumstances the caseous contents become cohesive and sticky, and of the consistency of putty. In very old cases the mass becomes dry and mealy, but shows little or no inclination to become calcareous.

Most characteristic is the colour of the mass, which is of a greenish yellow tint closely resembling the contents of the intestinal nodules produced by *Œsophagostoma columbianum*. In very advanced cases, as, for instance, those of old breeding ewes, the principal internal organs may on post-mortem examination be found to contain lesions which microscopically resemble those of tuberculosis. The lungs may be studded with small nodules the size of a pea, and the spleen and liver, in rare instances the kidneys also, may contain one or more foci of the same characteristic lesions, namely, a mass of greenish yellow material, surrounded by a firm fibrous sac. There seems, however, always to be a distinct division between the affected and the healthy tissue, and the total lack of an inflammatory zone is very characteristic. The bronchial and the mediastinal glands may be affected to a considerable extent without any lesions being found in the lungs, but at other times the lungs are extensively affected. The alterations may be either miliary or varying in size from a millet seed to that of a walnut. This condition is, as a rule, accompanied by a chronic pleurisy, with extensive adhesions, and also effusions into the pleural cavities.

In the liver the alterations are most frequently in the shape of larger nodules, consisting, like those in the lymphatic glands, of a firm, white, fibrous sac, containing a greenish yellow cheesy mass, of varying consistency. Cases have been observed, however, where the entire organ was filled with miliary nodules.

The kidneys are rarely affected, but when it occurs, the lesions assume the same characteristic appearance; that is, of a firm-walled abscess protruding on the surface of the organ. As a rule, only one or two such foci are observed in each case.

MICROSCOPICAL EXAMINATION.

Cover-glass preparations made from the caseous contents of a characteristic nodule furnish, as a rule, no clue to the cause of the disease. An amorphous granulated mass, in which the remains of disintegrated leucocytes may be seen, is the usual picture, and only when the preparations have been made from the periphery of the nodule or by scraping the inside of the capsule does the bacillus appear at all in abundance.

On histological examination of tissue containing miliary or submiliary nodules, the latter are seen to consist chiefly of leucocytes and nucleated

round cells, the greater part of which are irregular in shape, especially toward the centre, where many of them are transformed into a granular, detritus mass. Among the cells, singly or arranged in clumps, are seen the short, plump bacilli, which stain irregularly. The shape varies considerably, from oval or oblong to dumb-bell and club shape. The bacilli are frequently seen within the degenerated leucocytes, the destruction of which is no doubt due to specific chemical products excreted by these micro-organisms (Preisz).

The microscopic appearance is somewhat similar in all the lesions, whether located in lymph glands, liver, kidneys, or spleen. In the lungs the histological picture resembles that of the broncho-pneumonia. In the liver the lesions originate in the portal capillaries, where the bacilli become lodged and cause a proliferation of the endothelial cells, which, together with the accumulation of leucocytes and red blood corpuscles, cause an obliteration of the vessels. In no case have giant cells been observed. The surrounding hepatic cells become swollen, then granular, and finally they undergo atrophy, leaving open spaces between them. Bacilli are often seen among these degenerated hepatic cells, and no doubt they cause an extension of the process into the adjoining healthy tissue. At this period, however, a reaction takes place. Numerous round cells appear in the periphery of the nodule and gradually undergo a connective tissue metamorphosis, and become organised into an encapsulating membrane.

When a miliary nodule from the liver of an experiment animal which has been destroyed three weeks after inoculation is examined under the microscope, we observe the following picture: A caseous centre composed of an amorphous material that does not take any of the ordinary stains. Surrounding the centre may be seen numerous leucocytes, more or less degenerated, and frequently containing one or more bacilli, while clumps of these organisms are scattered among them. External to this is a dense round-cell infiltration the peripheral zone of which is undergoing connective-tissue metamorphosis and serving as line of demarcation between the atrophied liver cells and the central cell mass. This process then repeats itself centrifugally, causing the appearance of concentric layers, until a sufficiently strong reaction takes place to form a connective-tissue barrier strong enough to encapsulate the central part of the nodule and prevent its further growth. The nodules in the kidneys and lungs present a similar microscopic appearance, excepting that the foci in the lungs are more irregular on account of the catarrhal inflammation that accompanies the reaction of the surrounding tissue. The centre contains a dense mass of disintegrated cell structure composed of the desquamated and proliferated epithelial cells, degenerated leucocytes, and round cells. In experiment animals which succumb quickly to an intravenous injection of virulent material, the lung tissue immediately surrounding the nodules is frequently seen to be hepatised.

TECHNIQUE.

In preparing the above-mentioned pathological lesions for microscopic examination, the tissue was in all cases embedded in paraffin. The distribution of the bacilli and the histological characteristics are best brought out by means of Gram's method after the section has been previously

stained in alum carmine. Toluidin blue also gives excellent results. while hematoxylin-eosin and carbol-fuchsin counterstained with methylene blue gave less satisfaction.

BACTERIOLOGY.

Morphology.—The micro-organism of caseous lymph-adenitis is a short plump bacillus with rounded ends. In size and shape it varies greatly, according to the conditions under which it is seen. In fact its polymorphism is characteristic. In cover-glass preparations made from an affected lymph gland of a sheep, and stained after Gram, the various forms may be easily observed. Some are ovoid or nearly coccus shaped, while others are dumb-bell or club shaped. The latter range in size from 1.3 to 1.6 μ long and 0.4 μ thick. In the early cultures longer forms are observed, rounded at the ends and either straight or slightly curved. These larger forms show swellings at one or both extremities. The swollen part is more refractive to light, and stains more deeply than the remaining part. In old agar cultures the short ovoid forms predominate, and appear in hanging-drop preparations as diplo-bacilli, or unevenly arranged in clumps.

The bacillus is an aërobe, facultative anaërobe, and stains well by Ziehl's and Loeffler's method, and also by Gram's. It does not form spores, nor does it show vacuoles, crystals, or capsule. It is non-motile and flagellæ have not been observed. It is very susceptible to the effect of acids.

Cultural characteristics.—Cultures are most easily obtained by inoculating slant agar tubes with a portion of caseous material obtained from the periphery of an affected lymph gland. The first cultures grow slowly and sparsely, but when the bacilli accustom themselves to the artificial media a more profuse growth may be obtained in the subsequent series.

The growth produced on slant agar is very characteristic. If a loopful of the above-mentioned material is drawn over the surface there appears in the course of four or five days a limited number of well isolated colonies, showing at first as greyish white points. On the twelfth day they will have attained their full size; that is, 4 to 6 mm. in diameter, appearing as a thick greyish white expansion, more or less rounded, with a shiny wax-like slightly granular surface marked by wavy concentric rings arranged parallel to the margin. The colonies have crenated borders and a papillated centre.

When a pure culture is used for inoculation on slant agar the colonies appear in forty-eight hours, growing very abundantly over the whole surface and becoming confluent. All cultures grown on agar are characteristic in being extremely dry and cohesive when touched by the platinum wire. This cohesive property also manifests itself when cover-glass preparations are made and examined under the microscope. The bacilli are then found to be arranged in clumps. The pus from affected animals is likewise seen to be cohesive, and sometimes even assumes the consistency of glue.

In agar stab cultures, small greyish white globular colonies appear along the entire line of puncture. They do not become confluent, but remain separated and assume a fringed exterior. In the course of forty-eight hours a characteristic growth, similar to that which occurs on slant agar, appears on the surface and spreads slowly.

Agar plate cultures are made in preference to gelatine plates, as the

growth is extremely slow at room temperature. The best results are obtained by making smear inoculations on the surface of the media after it has become solid in the plates. The colonies are in every respect similar to those on slant agar. When the regular method of plating is adopted deep colonies are observed. They attain a size of one-half millimetre in diameter, are regular in shape, and of a greyish white colour.

Glycerine agar is not a very favourable medium; the bacillus grows more slowly and not so abundantly as in agar.

In *peptonised beef bouillon* (1 per cent + to phenolphthalein) a general turbidity occurs in the course of thirty-six hours. Then the bouillon gradually becomes clear, when a granular sediment collects on the bottom of the tube. A scaly, greyish white, greasy-looking pellicle forms on the surface and adheres closely to sides of the tube, but by agitation it is broken up into flakes which settle to the bottom. A new pellicle is slowly formed, but it never becomes as strong as the original one.

The bacillus will grow in both alkaline and acid broth (2 per cent. + to phenolphthalein), but an acidity of 2.8 per cent. kills the organism. Old bouillon cultures give a pronounced alkaline reaction.

Gelatine at room temperature does not prove a desirable media for the organism. When incubated at 37.5° C. the growth is identical with that in bouillon.

On *blood serum* the bacillus grows more readily than on any other media, although the cultures are not so characteristic as are those on agar. The growth is marked at the end of forty-eight hours by the appearance of small pin-point colonies, which increase slowly until the tenth day, when they have attained a diameter of 1 to 1.5 mm. The border is slightly irregular, with a dry, glistening uneven surface of a colour varying from deep yellow to greyish white. The colonies appear to send off lines of growth extending below the surface, and are surrounded by a cloudy zone, which reflects to a greater or less degree the colour of the colony. This outward radiation becomes more marked until finally the contour of the colony is entirely effaced. The property of chromogenesis varies greatly, even under uniform conditions, although serum from cattle produces a more stable coloration than does that of the dog. The water of condensation contains a copious sediment of small granules, which give it the tint of the colonies.

On *potato* the growth varies to a great extent. This is probably due to variations in the acidity of the media, and may possibly be dependent upon the vitality or sensibility of the inoculated material. On potato with an acidity of from 0.9 to 1.8 per cent. + to phenolphthalein a greyish white, slightly moist growth spreads irregularly over the surface. In some cases it is hardly visible to the naked eye, and, as a rule, it reaches its maximum growth at the end of the second week. With an acidity of 2.9 to 3.6 per cent. no growth occurs, while the addition of a few drops of a 5 per cent. sodium hydroxide solution to the surface will cause the growth to appear.

In *milk* growth takes place without visible change; no whey is formed, nor is the milk coagulated.

Fermentation of Sugar.—Bouillon containing 1 per cent. of dextrose in fermentation tubes become cloudy in thirty-six hours, and after forty-eight hours a pellicle is formed on the surface of the broth in the bulb, while a sediment appears at the elbow. Fermentation occurs in the bulb causing an acid reaction, while the contents in the closed tube remain unchanged (phenolphthalein test). Similar tubes containing 1 per cent. of lactose and

saccharose show the same form of growth, but differ as to their profuseness. The culture in lactose is not so abundant as in dextrose, while in saccharose it is still less profuse than in lactose. The bacilli have no action upon the molecule of lactose or saccharose. Gas is not produced during growth in any of these sugar-containing media.

Indol and Phenol.—Cultures in a peptone solution treated after Kitasatos's method failed to give the indol reaction. When treated according to Weyl-Lewandowski neither the phenol nor indol reaction could be observed.

Temperature requirements.—The temperature at which the organism develops most abundantly is 37° C., although in suitable media growth may occur more slowly in room temperature. Bouillon tubes kept at a temperature of from 16° to 18° C. became fertile, but no growth occurred at a temperature of 43° C.

Thermal Death Point.—Tubes of bouillon inoculated with one-fourth cubic centimeter of a fresh bouillon culture and exposed in a water bath to a temperature of 65° C. for ten minutes or longer did not develop. A three-days-old culture exposed to 70° C. for six minutes became sterile. An exposure of sixteen minutes to 60° C. did not prevent development, while eighteen minutes at 60° C. killed the organism.

Effect of Dessication.—Two platinum wire loopsful of a bouillon culture were placed in a sterile tube and put in the incubator over-night to dry. When subsequently exposed to the effect of sunlight for five days, the vitality of the organism was still retained. Tubes similarly prepared and exposed for six days or more proved to be sterile.

Effect of Low Temperature.—Bouillon tubes inoculated with the organism were packed in a freezing mixture twice daily for three days and placed in the ice chest. These showed subsequent growth when incubated at 37° C. Similar tubes kept in the ice chest at a temperature of 6° to 8° C. for a period of several weeks showed subsequent development when inoculated at 37° C.

Action of Disinfectants.—A 2·5 per cent. solution of carbolic acid proved fatal in one minute. A 0·25 per cent. solution of formalin killed the organism in six minutes. Lime water did not retard subsequent growth after an exposure of twenty-three hours. A 1-2000 solution of bichloride of mercury caused the death of the bacillus in four minutes.

EXPERIMENTS WITH SHEEP.

Intravenous Inoculation.—On January 10 an adult male sheep was inoculated into the jugular vein with 0·5 cc. of a filtered emulsion, made by mixing the caseous contents of a sublumbar lymph gland of a rabbit with a normal salt solution. On the third day after injection the animal appeared languid and began to lose flesh. On January 24 it weighed 126 pounds, on February 5, 122 pounds, and on March 3, 113 pounds. After that time the animal began to recover, and gained in flesh until two weeks later, when it was killed. On post-mortem examination the lungs were found to be studded with numerous pearly white nodules the size of beans. These nodules had all the characteristic appearances of the lesions observed in caseous lymph-adenitis; that is, a thick, greyish white, fibrous capsule inclosing a mass of greenish yellow cohesive pus. A similar nodule was observed in the liver. This, too, had been entirely walled off, and seemed

to have reached the end of its development. The left prescapular and sublumbar glands were considerably enlarged, but no degenerative foci could be observed in either of them. Pure cultures of the bacillus of Preisz were obtained from the nodules in the liver and lungs.

On April 30 a yearling sheep was inoculated intravenously with 1 cc. of a two-days-old bouillon culture. The animal developed all the symptoms of acute septicemia, and was found dead on the evening of the fifth day. This was, unfortunately, on a Saturday, and when the carcase was brought to the laboratory on Monday morning decomposition had set in to such a degree as partially to obscure the pathological lesions.

A post-mortem showed, however, the prescapular glands enlarged and œdematous. The lungs were highly congested; the liver enlarged and fatty degenerated; the spleen soft and friable; the kidneys flabby and of a very dark colour; blood thick and tarry. No caseous foci were observed in any of the organs. No bacteriological examination was made.

Subcutaneous Inoculation.—On January 10 an adult sheep was injected subcutaneously on the inside of the left thigh with 0·5 cc. of the same gland emulsion as that which was used for intravenous injection on the first-mentioned sheep. In the course of two days an extensive inflammatory swelling developed at the point of inoculation, and caused the animal to go lame. In the course of a week the inflammation disappeared, and a large abscess developed. This did not open until February 9, nearly one month after the inoculation, when a great quantity of thick creamy pus was discharged. The wound healed without difficulty, leaving only a fibrous induration under the skin. On April 27, when the animal was killed, this induration was found to contain three small abscesses the size of hazel nuts, containing the characteristic greenish yellow cohesive pus. No other lesions were found in any part of the carcase.

On April 30 a yearling sheep was inoculated subcutaneously with 1 cc. of a two-days-old bouillon culture. In the course of two days the animal became droopy, and from then on continued to lose flesh until it died on May 10. On post-mortem the muscles at the place of inoculation (the inside of the thigh) were found to be swollen, and contained a large necrotic centre. The adjoining lymphatic glands were greatly enlarged, containing foci of caseous material. The lungs contained a number of small foci the size of millet seeds. No lesions were found in any of the other organs.

On June 3 another adult sheep was inoculated subcutaneously in the left axillary region with 1 cc. of a four-days-old bouillon culture. The animal soon began to droop, lose its appetite, and at the end of the second week had lost 11 pounds in weight. On July 31 the sheep was slaughtered, and on post-mortem examination was found to be very anæmic and greatly emaciated. At the point of inoculation a large abscess had formed, and had become encapsulated in a thick fibrous membrane. The left prescapular gland was greatly enlarged, and showed on section a number of greenish yellow foci. The lungs contained eight or nine nodules, varying in size from that of a millet seed to that of a pea. The nodules were all situated on the surface directly under the pleura, and were surrounded by apparently normal lung tissue. The liver was somewhat enlarged, and showed two small caseous foci in the middle lobe. In one of the mesenteric glands three small caseous foci were observed, from which pure cultures of the characteristic bacillus were obtained. This is the only instance where

the writers have observed an infection of the mesenteric glands. All the other organs were normal.

Feeding Experiments.—On January 30 two adult sheep were fed on a small quantity of oats and bran which had been moistened with 30 cc. of an emulsion from a number of caseous lymph glands of a rabbit which had just died from an experimental infection. The material was eaten at once, but the animals continued to thrive and put on flesh. When slaughtered after forty-nine days none of the characteristic lesions could be observed in any of the organs.

ECONOMIC IMPORTANCE OF CASEOUS LYMPH-ADENITIS IN SHEEP.

As already stated, the disease in question is but little known to either the sheep-raisers or to the practising veterinarians of this or any other country where it prevails. Only the meat inspectors have an opportunity to become familiar with the lesions, as by far the greater majority of affected animals show no symptoms during life. This is evidently due to a faculty possessed by the ovine species of localising the infection after it has gained entrance to the system. The characteristic encapsulated condition of the lesions demonstrates clearly that the system, when in prime condition, reacts immediately and throws an insurmountable barrier around the centre of infection. Like tuberculosis, caseous lymph-adenitis is pre eminently a disease of the lymphatics, and remains, under favourable con ditions, confined to these. Only when the vitality of the animal is lowered for some reason or other, do the micro-organisms gain entrance to the circulation and cause lesions to develop in the other organs. It is therefore unquestionable that the prognosis in all cases where young animals are affected must be considered good, and, as 95 per cent. of all sheep go to market before they reach the dangerous age, there is, so far as we are able to judge with our present knowledge of the disease, no reason to look upon its spread with apprehension.

It is, as previously stated, doubtful whether the appearance of the disease in this country is of recent origin, and many facts, especially its benign nature and its wide spread, would seem to indicate that caseous lymph-adenitis is a disease which has prevailed for centuries. The very fact that the disease has not assumed a more virulent form during the past few decades, when the great majority of the native sheep have been graded up by means of veritable hot-house strains of pure blood, indicates that we are dealing with a disease the virulence of which is not what it has been, and consequently one which we need not fear will threaten with ravages the further improvement of the sheep stock of this country. If the disease were a new one or one whose once attenuated virulence were recrudescing with the improvement of the sheep breeds and their subsequent greater susceptibility to infection, then it would not seem probable that each individual should be possessed of such a remarkable power of resistance to it. In bovine tuberculosis an individual tendency to localise the disease by means of an encapsulating process has been observed frequently, but this is, unfortunately, the exception and not the rule. It would therefore seem reasonable to conclude that the ovine species has not acquired this faculty except through the exposure to the infection of an indefinite number of generations.

[This disease is well known to Scottish sheep farmers, and is known as "Cruels."

It was briefly referred to by Williams in "Principles and Practice of Veterinary Medicine," and was considered by him to be a form of "tuberculosis."

Many years ago a considerable number of pedigree black-faced young rams were stopped from proceeding to a sale ring, as the veterinary inspector at the place was of opinion that they were affected with a form of glanders, but on being informed that it was a common affection of well-bred sheep, he reluctantly allowed them to pass.

I myself have described the symptoms of "Cruels" to my class for the the last twenty years.—*Ed.* VET. JOURNAL.]

DISCUSSION ON RELATIVE MERITS OF THE DIFFERENT METHODS OF INOCULATION AGAINST RINDERPEST IN RELATION TO INDIAN CONDITIONS.

ABSTRACT FROM A REPORT ON AN EXPERIMENTAL INVESTIGATION OF THE METHODS OF INOCULATION AGAINST RINDERPEST FROM THE BACTERIOLOGICAL LABORATORY, MUKTESAR, INDIA.

IN discussing the merits of the various methods of inoculating against rinderpest in the light of the experiments recorded by Dr. Leonard Roger, Officiating Imperial Bacteriologist to the Government of India, in the earlier sections of his most exhaustive and valuable report, together with the experience of workers in other countries, and in relationship to the conditions under which the disease exists in this country, which has been touched upon on page 2 of the report, and in narrating recent experience in inoculating in actual outbreaks in the last section, it will tend to simplify matters greatly if the advantages and disadvantages of the different methods are first concisely stated.

I.—KOCH'S BILE METHOD.

(*a*) ADVANTAGES.

1. *Absence of Reactionary Fever.*—As no temperature reaction, except sometimes for a day or two on account of the swelling at the seat of inoculation of about the size of a cricket ball, follows the injection of bile, there is no loss of milk or chance of abortion in cows.

2. *Absence of Infection.*—As no disease is produced by the bile inoculation, if the precautions mentioned on page 5 of the report are taken, a clean herd can be inoculated by this method without the introduction of any infection as is the case with the other bile methods followed by blood injection, and in the serum simultaneous and re-inoculation methods.

3. *Only a single inoculation is required*, against two in the other bile methods, and in some of the animals in the re-inoculation method.

(*b*) DISADVANTAGES.

1. *Complete immunity is not obtained for ten days* after the inoculation, during which time the animals may take the disease in a fatal form.

2. *The short duration of the immunity*, which averages about four months, and may not exceed three weeks in some of the animals.

3. *Difficulty of obtaining suitable Biles in sufficient numbers in ordinary village outbreaks.*—This is a very serious disadvantage in India, where cattle cannot be inoculated and killed on the proper day as was the case in South Africa, where from 3 to 7 per cent. of herds were sacrificed to obtain bile to protect the rest, a measure which was necessitated by the rapidity of the spread and the mortality caused by the disease, but which the comparative mildness of the affection in this country would not justify, even if it were possible to carry it out. If, on the other hand, biles are to be obtained from animals which die of the disease in the course of an outbreak, the difficulty arises that only from 17 to 26 per cent of the biles, according to whether the original directions of Professor Koch or the later advice of Turner and Kolle is followed, are fit for use, and as each animal, if a hill one, yields only on the average eighteen doses of bile, or about double that amount if a plains one, from each animal which dies, only three to five animals in the case of the former and double that number in that of the latter class of animals can be inoculated. This also pre-supposes that the exact day of the disease on which the animal died is known, which in villages would very often not be the case, and that the villagers would permit post-mortems on all the animals dying of the disease, and the bile obtained from them to be injected into their healthy animals, which has not yet been attempted in the case of native-owned cattle in this country as far as I am aware.

4. This method is practically useless in the case of hill cattle, as the immunity produced does not last for a month in many cases, and in some fails to be produced even at the end of ten days, while in addition the disease spreads so rapidly among these animals that great loss would occur during the ten days before immunity is afforded by bile.

5. The bile cannot be kept for more than a few days, and must therefore be obtained on the spot.

II.—Edington's Glycerine Bile Method.

(*a*) Advantages.

1. Immunity of long duration is obtained in those animals which have an attack of the disease or a temperature reaction after the second or blood inoculation.

2. A slightly larger percentage of biles can be used, namely, 33 per cent. instead of 26 per cent. by Koch's method. Still from each animal which dies only from six to twelve other animals can be done on the average.

3. The biles can be kept for a long time after they are glycerinated and are said to preserve their immunising powers for upwards of a year.

(*b*) Disadvantages.

1. Full immunity is not obtained for at least ten days, and the animal must be protected from natural infection for two or three days after the second or blood injection.

2. A large proportion of the animals (two-thirds in the Muktesar experiments on plains cattle) fail to react, and hence obtain but a short immunity of from three to four months' duration, while in some instances

in South Africa, in which a large proportion of the animals reacted, there was a loss of from 5 to 10 per cent. (Edgar).

3. The reactions obtained are much less under control than with the serum simultaneous and re-inoculation methods, for, while the majority of the animals may fail to react at all, some of them may suffer severely from rinderpest, more so than Indian villagers would appreciate, at first at all events, until they learnt by experience the benefits of the inoculations.

4. Infection is introduced by this method, an objection which applies equally to all the methods which produce lengthy immunity.

5. As in the case of Koch's method, the biles will have to be obtained at the seat of the outbreak, while Edington also says that they must be kept for eight days after the glycerine is added before being used, so that this time must be added to the ten days that must elapse before immunity is obtained. In India this is a serious drawback, because by the time information of an outbreak has filtered through the usual official channels, it will generally at least have reached its height before help arrives, and if (allowing three days for collecting the biles) three weeks more is to elapse before protection can be given to the affected herds, much of its value will have been lost, and the villagers will be greatly discouraged by the continuance of the disease during this period.

6. A double inoculation is necessary, involving collecting all the animals a second time.

7. This method, again, is not only useless but nearly always fatal in the case of the hill animals.

In pointing out the above disadvantages, I do not wish it to be understood that I consider this method useless or impracticable in India, because in the case of plains animals I have obtained evidence that immunity, which would usually outlast the particular outbreak in which it might be used, can be obtained with a very considerable degree of safety; but on the other hand the difficulties of carrying out the method in this country must be fairly considered in coming to any conclusion as to the suitability of it to the conditions met with in Indian villages, and the prejudices of the people must be reckoned with. Unfortunately it has not yet been found practicable to put the matter to the test in the field, but it is to be hoped that this will soon be done, as a little practical experience will be of much greater value than any amount of abstract reasoning.

III.—The Filtered Bile Method.

The use of bile which has been passed through a porcelain filter followed by an injection of virulent blood ten days later, after the manner of the glycerinated bile method, presents the same advantages and disadvantages as the previous method, with the following exceptions:—

(*a*) Advantages of filtered over the glycerinated bile.

1. A week's time is gained owing to being able to use it at once after filtering, whatever its condition may have been previously.

2. As biles which are putrid can be used after filtering, 75 per cent. of all biles can be utilised by this method, and the average number of animals which can be inoculated from each one that has died of the disease is from thirteen to twenty-six, in accordance with the size of the animal from which it is taken, these figures being more than twice those of the glycerinated

bile method, an important consideration in sporadic outbreaks of the disease, which are so common in India, and in which but very few post-mortems may be obtainable at the time that biles are required.

(*b*) DISADVANTAGES.

1. It is not yet known whether filtered biles can be kept for a length of time without losing their immunising properties, but it is probable that a means of doing so will shortly be found.

Porcelain filters either worked by suction or by pressure can be readily obtained in India, and I found that rinderpest biles can easily be filtered by either form of apparatus, and if run into a flask which has had water boiled in it, and then after emptying rapidly is plugged with cotton wool, it will keep for some time. It is now being preserved by the addition of carbolic acid to make up one-half per cent., but how long it will keep its properties in this way has not yet been tested. Pressure filters give a more rapid yield than the other forms.

This method is also useless and dangerous in the case of hill cattle, although it gave slightly better results than did the glycerinated bile.

IV.—SERUM ALONE.

The use of serum alone presents the same advantages as Koch's bile method, namely, that it causes no reactionary fever and there is even less chance of infection than in the case of the bile. It has also the same disadvantage of giving only a passive and therefore temporary immunity. It, however, presents over the bile method the following :—

(*a*) ADVANTAGES.

1. It affords immediate full immunity, while in addition it will modify an attack of the disease which the animal may have contracted one or two days before its use, being in the incubation period when inoculated, twelve days being thus gained over the bile method.

2. It can be prepared in any quantity and kept ready for use, while in the case of clean dairy herds, in which the bile might be of service, ten days more would have to be allowed for the inoculation of buffaloes before the biles could be obtained, allowing four days for the incubation period and six for the disease to run, the minimum possible time, so that the full gain of time under such circumstances of the serum over the bile method would be twenty-two days, or three weeks, a matter which might be of very great importance. As in Turkey, 25 c.c. of a strong serum used alone was found to give sufficient immunity to last over the course of several outbreaks in which it was used, this method, which it has not yet been possible to adequately test in India, evidently presents great advantages under certain conditions in spite of the immunity produced by it only lasting for a few months.

V.—SERUM SIMULTANEOUS METHOD OF TURNER AND KOLLE.

(*a*) ADVANTAGES.

1. The serum may be made in large quantity and kept ready for use.
2. Immediate immunity is produced, while in animals in the first half,

XUM

at any rate, of the incubation period at the time they are inoculated, the disease is modified and ultimately full protection is afforded them.

3. In those animals which react, immunity, which is probably as great as after an attack of the disease, is produced, while those which do not react are still protected for a few months (except in the case of hill cattle), which will usually carry them safely through the particular outbreak by which they are threatened in this country, although it will have passed off before another one arrives.

4. A larger proportion of reactions with long active immunity can be obtained by this method than with those in which bile is followed, after an interval, by blood. The reactions obtained are also more even and better under control than after the glycerine and filtered bile methods.

5. Only one inoculation is required, as against two in the other methods, which produce lengthy immunity.

(*b*) DISADVANTAGES.

1. In India a much smaller percentage of reactions is obtained by this method, when safe doses of serum are used, than was the case in South Africa, owing to the greater variability of the resistance of the cattle of this country to rinderpest. This is a very important point, as in herds which were inoculated by the serum simultaneous method, a large percentage of reactions were obtained in one herd, while only a very few occurred in another one done at just about the same time and with the same doses of same serum, the figures varying in different instances from 4 to 100 per cent. of reactions, and is usually from 50 to 66 per cent. As the great advantage claimed for this method is the number of cases that can be passed through a mild attack of the disease with resulting long immunity, which is said by its authors to have amounted to 90 per cent. of the animals inoculated in South Africa, the frequent failure to obtain a good proportion of reactions in herds of this country is a serious drawback to the process, although it still compares favourably with the glycerine and filtered bile methods in this respect, but unfavourably with the re-inoculation method.

2. If, on the other hand, a smaller dose of serum is used in order to obtain a larger proportion of reactions, then many of the animals will be more seriously ill than Indian villagers will care for or allow a second time, and some of them will die.

3. As in all the methods which afford long immunity, infection may be introduced by this method, but the experience both in South Africa and in India shows that this danger is a very slight one.

4. The most serious objection to this method, which proves that it is by no means an ideal one, is that it is useless in the case of Kumaon hill cattle, as in these very susceptible animals doses of serum used by this method of from four to six times as great, relatively to the weights of the animals, as are safe in plains cattle, caused fatal disease in some of them, while the others failed to react at all, and those which did not react contracted the disease within three weeks of the inoculation by natural infection in a fatal form. This very unfavourable result is the more surprising, as it might have been expected that a very large proportion of safe reactions would easily have been obtained in these animals, because they present a very similar degree of susceptibility to rinderpest to that met

with in South African cattle, so this result is all the more disappointing. If, on the other hand, a very large dose of serum is used in this method, temporary protection is obtained, which may possibly last through the very short and severe outbreaks met with in these hills, but this practically reduces the method to the level of using serum alone as very few of the animals will react and permanent immunity will not result.

Fortunately this difficulty has been got over by the modification of the serum simultaneous method which is described below.

VI.—Re-inoculation Method.

This modification of the serum simultaneous method consists in using a sufficiently large dose of serum on one side of the animal as to so far counteract the small dose of blood injected on the other side at the same time, that only a mild and safe form of the disease is produced in any of the animals, and no loss is incurred, while those which do not show any reaction at the end of a week or ten days are injected at the end of that time with a second dose of blood which may be from 1 to 10 c.c. By this means a reaction of a mild nature is obtained in practically all animals which have not natural or acquired immunity already, and a whole herd can be given an active and lengthy immunity by its means without making more than a very few of them seriously ill and without any loss. Turner and Kolle advise that as many as possible of the animals should be made as seriously ill as is consistent with the recovery of the vast majority of them, but such a result would not be favourably regarded by the ignorant villagers of this country, and would at once bring the method into disrepute. On the other hand, if this is avoided by the use of slightly larger doses of serum, then anything from one to two-thirds of the animals will fail to react, and although they will in most cases be protected through the particular outbreak for which they are inoculated, they will be liable to take the disease should it re-appear during the next year or at a later date, and the villagers finding the protection of such short duration, especially as compared with that produced by vaccination against small-pox, would soon lose faith in the process. Both these difficulties are got over by the method now described, which I think presents special advantages in the case of the plains animals of India, while by it alone can hill animals be safely passed through a mild attack of rinderpest with resulting long immunity, for in these animals the bile methods are also useless and dangerous, while although temporary immunity of sufficient duration could be obtained by enormous doses of serum alone, the large quantity required would make the method too expensive to be practical on a more than a very small scale, as the dose would most likely have to be several times as large as by the re-inoculation method, by which it already amounts to nine times as much in proportion to the weight of the animal as is necessary for plains cattle. The advantages and disadvantages of this method, in comparison with the serum simultaneous method, may be summed up as follows :—

(*a*) Advantages.

1. A mild and safe reaction,—but one which the experiments recorded in Section IV. of this report prove to be very nearly if not quite equal in their effects to a severe attack of the disease,—can be obtained in a much

larger proportion of the animals than by any other method, without any loss, and with few severe attacks of the disease.

2. Hill animals can be safely passed through a mild attack of rinderpest by this method with little, if any loss, which cannot be done by any other method, so that it appears probable that it will be applicable to all breeds of cattle, which the failure of the other methods in these hill animals proves cannot be said of any of the South African ones.

(*b*) DISADVANTAGE.

1. A second inoculation is necessary in some of the animals, while the reactions following the first injection will have to be carefully watched, and preferably the temperatures should be taken in the evenings of from the fourth to the seventh or eighth days in those animals which have not already shown any evident reactions. The numbers in which this is required would decrease every day, while even if a second injection were given in some of those animals which already had a slight temperature reaction no harm would result. A veterinary assistant would be quite capable of making these observations, while after he had gained some experience he would be able to detect any fever without taking the temperature of more than a few animals which he was doubtful about. The villages would in any case have to be re-visited to ascertain the results at the end of about a week, when the re-inoculations of the non-reacting animals could be carried out.

The necessary Conditions to ensure Successful Inoculations in India.

Before finally summing up the conclusions derived from the preceding discussion as to the most suitable method or methods, it will be well to briefly indicate the essentials to the success of any method in this country, so that we may better be able to judge which of those described most nearly approaches the ideal.

1. *Simplicity.*—In this respect Koch's bile method, the use of serum alone, and the serum simultaneous method have the advantage in as far as they require only a single inoculation, but the former labours under a serious counter-balancing disadvantage on account of the difficulty of obtaining suitable biles in this country, and the impossibility of keeping them for more than a few days. while on the other hand, serum can be prepared in large quantities and kept ready for use. The re-inoculation method is also less simple than the serum simultaneous one, owing to a second inoculation being required in some of the animals.

2. *Immediate Immunity.*—The great advantage of the production of protection as soon as possible after the inoculation, will be very evident when it is considered that in the vast majority of the cases in which they are likely to be undertaken in this country, will be in actual outbreaks of the disease, which will seldom be reached before they have arrived at their height, so that if two or three weeks are to elapse before protection can be afforded their value will be materially lessened. From this point of view the serum methods have a very great advantage over all the bile methods.

3. *Lasting Immunity.*—Here the glycerine and filtered bile, and the serum simultaneous and re-inoculation methods have a great advantage over Koch's bile method, and the use of serum alone, but their relative

usefulness is in proportion to the percentage of reactions that can be obtained by them, from which point of view they rank in reverse order to that in which they have been mentioned, the re-inoculation method giving most and the glycerine and filtered bile fewer than the serum simultaneous method.

4. *Safety.*—All the methods can be used in plains cattle with a very considerable degree of safety, but the simple serum and bile methods have a slight advantage here, which is, however, much more than counterbalanced by the shortness of the immunity produced by them. If the percentage of the reactions obtained is considered in relation to the danger of loss of life among the animals and of loss of work owing to their being laid up for some time by a severe attack of the disease, the order of merit will be the same as if under the preceding heading, namely, the re-inoculation method will come first, and then the serum simultaneous, while the glycerinated and filtered bile come last.

Under this heading, too, the danger of the introduction of the disease by inoculations must be considered, and here we find the methods are sharply divided into two classes, namely, the simple bile and serum methods which (with proper precautions in the case of the former) do not produce the disease, and the others which do cause it. As, however, the former only afford temporary protection while the latter may give lengthy immunity, these attributes balance each other, and the two classes are each suitable under certain conditions, which will be considered immediately. Further, the fact above mentioned, that inoculations will, as a rule, only be carried out in infected herds or those immediately exposed to infection, and the experience of South Africa that there is very little tendency for the disease to be spread by inoculated herds, reduces this disadvantage to small practical importance.

THE VACCINE INSTITUTE AT ALDERSHOT.

Services Protection against Smallpox.

The Vaccine Institute consists of three rooms and two outbuildings. It is into one of these—the isolation stall—that the calf, which is to undergo vaccination, is first taken. A healthy animal from four to six months old is selected and placed for some three days in the isolation house. There it is thoroughly overhauled by Major Moore or Captain Meredith, A.V.D., and kept under observation until they are completely satisfied as to its general healthiness. Only then it is brought across to the institute proper, and placed in one of the three compartments fitted up as a stall. Here it enters at once an atmosphere which is kept constantly disinfected by the burning of formaline gas tablets. It lies on sterilised and disinfected straw, is fed on the very best food, is kept in a constant temperature, and provided with such sanitary arrangements that contamination from that source is impossible. Under such conditions dangerous germs have no possible chance of surviving, should they by chance have existed previously.

This, so to speak, is the calf's living room. The operation chamber immediately adjoins. It is not such a terrible looking place as might be expected. Its most noticeable piece of furniture is, of course, the operating table. The top moves on an axis, and when the calf is first introduced stands vertically. Before it is ready for the table, however, the

XUM

animal is washed all over with an antiseptic, and clipped on the belly first with horse clippers, and afterwards with ordinary toilet clippers. These and the razors just at hand suggest, as the Major remarked, something of the appearance of a barber's shop, and the calf has, in fact, to undergo a regular dandy's trim up, only the clipping and shaving are done to the under part of the body. After the necessary preliminaries it is brought alongside the table, secured by straps passed over sterilised cloths, so that they do not actually touch the body, and then with a turn the table is righted and the calf is in position. The uppermost of the hind legs is held firmly out of the way by means of a high support to which it is strapped, and then the abdomen and thighs thus exposed are shaved with an ordinary and then with a safety razor. Another washing of the shaved portion with antiseptic soap and sterilised water precedes the actual operation, to perform which Major Moore now appears on the scene.

The original vaccination was done in the form of small squares scratched on the shaven belly with a scalpel or lancet. To this the major early felt the force of several disadvantages. In the first place, to cover the parts with the squares occupied an hour and a quarter, a long period of torture for the calf, even though the actual pain was not much. Then in gathering up the vaccine afterwards by means of a clamp, it was not possible to obtain it free from blood and discoloration, concerning which those to whom it was supplied had to be notified that the discoloration did not in any way affect its efficacy. Instead of continuing these methods Major Moore has adopted the plan of making the incisions in straight lines and gathering up the vaccination afterwards with a specially-made "spoon." The former process instead of lasting an hour and a quarter can now be done in fifteen minutes, and the latter about as quickly, thus saving two hours' torture to the calf. The vaccine also comes out a delicate white colour, except in the case of Alderney calves, when the colour is sometimes yellow. Between the two chief parts of the operation a great deal more is done. Thus after the vaccination in lines and the introduction of the lymph, the animal is taken back to the stall chamber and kept there 120 hours to a minute. When it is brought back to the table the vaccinated portion is washed again with water boiled and sterilised, and brushed with a small brush. After it has been thoroughly cleansed a spray of glycerine water is played over to moisten the scabs, and the vaccine is then gathered up with the spoon already mentioned. After being weighed the vaccine is mixed with a sufficient quantity of double-distilled glycerine, and then ground in an agate mortar till it is rendered malleable and workable. The same end is brought about yet more effectually by passing the vaccine through a small but elaborately constructed mill, every part of which, like all the other instruments and apparatus, is kept thoroughly disinfected. By this time the precious preparation is ready for the "stock bottles," tiny vials, which are yet capable of holding enough for the vaccination of 300 persons. These stock bottles are hermetically sealed with boiling wax, and within the lymph awaits the indents from the medical officer requiring it.

HOW THE VACCINE IS PROTECTED.

The orders received at the Vaccine Institute vary from one to 5000 quantities of the lymph at one time. The issue takes place in the air-tight glass case, very like the glass mounts on which objects are exhibited under

the microscope. The glasses are of two sizes, those capable of enclosing lymph for five vaccinations and others for ten. In each glass the fluid appears as a white disc between the two small glass sheets, the edges of which are again hermetically sealed with boiling wax. This, however, is only a small portion of the protection afforded the lymph. The case is next covered with lead paper, then placed in a sealed envelope, wrapped round with cotton wool, and eventually enclosed in a small box. For home stations these boxes are of wood, but for foreign stations a metal box is used, in order that the lymph may not be affected by the temperature through which it may travel. If exposed to a temperature lower than 45 degrees or higher than 60 degrees it would speedily lose its properties.

There are, however, two further precautions before the issue takes place at all. Certain quantities of the lymph are "cultivated" in an incubator in the third room of the Institute. The object is to detect the presence of any germs which may have miraculously escaped all previous tests. The cultivation is accomplished in tubes placed within the incubator, and the contents are submitted to a strict bacteriological examination. The operations of any other germ than the cow-pox itself would be at once detected. The singular thing is that, though the operations of the cow-pox germ itself are easily apparent, no instrument has yet been devised by which the tiny creature can be seen and captured. £1000 reward awaits the first student who makes the discovery. The germs of erysipelas, tetanus (lock-jaw), tubercle, and others of dangerous activity are, however, thoroughly known, and in the bacteriological test they cannot pass unnoticed.

The calf itself is taken, after the lymph has been obtained, to a perfectly fitted up slaughter-house, which forms the second outbuilding mentioned at the commencement. After it has been slaughtered Major Moore or the Assistant Professor makes a minute post-mortem examination, and if anything amiss is detected, the vaccine is not issued to the troops.

The quantity of vaccine that can be obtained from one calf varies greatly. The least amount taken will suffice 3000 people, and quite recently a record of 16,000 was reached. The enormous difference is explained as due to the peculiar characteristics of the individual calf. By the same rule, lymph taken from one source will affect a number of persons vaccinated with it in quite different ways. Lymph was issued last year from the Vaccine Institute for 101,680 persons.

The mixing of the lymph with glycerine as described above has been in practice at the Institute since 1889, and was probably originated there. In connection with this a curious thing happened lately. A deputation came down from the War Office to inspect the Institute, and to recommend the use of glycerine in this way. The value of the process had just reached Headquarters after travelling by way of the Continent, and they were surprised therefore to find a process which they believed to be new had been in operation at the Institute for something like twelve years.

Major Moore, as is only to be expected, is a firm believer in vaccination from calf lymph. The arm to arm process does not commend itself to him, but when all possible precautions are taken and calf lymph is used, there can be, he maintains, no question of the protection afforded by vaccination.

This Institute is under the care and supervision of Veterinary-Lieutenant-Colonel Clayton, D.V.O., Veterinary-Major R. Moore, F.R.C.V.S., and Veterinary-Captain Meredith, F.R.C.V.S., the two latter are Professors of Veterinary Science.

XUM

THE BIOLOGICAL TEST AS AN AID IN THE INSPECTION OF MEAT.

UHLENHUTH, who drew attention to a method of recognising the blood of various animals as distinguished from one another, has lately published a modification of his methods, whereby he is enabled to recognise the different kinds of meats, such as horse, ox, dog, pig, &c.

In 1898 M. Bordet showed that the blood serum of animals submitted to injections of defibrinated blood coming from an animal of a different species acquired after a certain time the property of agglutinating and dissolving the blood corpuscles in blood of the kind of which the injections were made. He observed also that on mixing the defibrinating blood with the active serum the mixture became in a few minutes red, clear, and limpid. In another paper on the same subject published in 1899 he stated that on the addition of the active serum to the serum of the other animal the latter became at first opaque, and that after a short time a flocculent precipitate fell. Uhlenhuth has recently sought to apply this observation to the discrimination of human blood. He carried out a series of researches at first with the blood of the ox, and afterwards with human blood. Into the peritoneal cavity of rabbits he injected 10 c.cm. of defibrinated ox blood every six or eight days, and after five injections obtained a serum which showed itself exclusively destructive with respect to ox blood. Having prepared a series of 1 per cent. dilutions of the blood of eighteen species of animals, which were then cleared by settling or filtering and further diluted by the addition of an equal quantity of 1·6 per cent. salt solution, they were arranged in a series of test tubes, to all of which by means of a pipette six to eight drops of the rabbit's serum were added. The result was that the liquid in all the tubes except that which contained the blood of the ox remained perfectly clear, while in the latter the liquid became turbid, and ultimately a flocculent precipitate formed. A similar experiment with human blood succeeded in distinguishing human from ox blood stains which had been dried for four weeks upon a plank. These experiments have been confirmed independently by Wassermann and Schutze, who have compared the result in the case of man, and the blood of twenty-three different species of animals. The only exception was the blood of the monkey, which determined a slight precipitate after some delay. They were able to show the efficacy of this proceeding with blood stains three months old, and otherwise hardly recognisable. They recommend the following method:—After having soaked the material of the stain to be examined in 6 to 8 c.cm. of physiological salt solution, and having carefully filtered the liquid thus obtained, it is divided into two equal portions in two sterilised tubes. To one is added $\frac{1}{2}$ c.cm. of serum from a rabbit which has received injections of human serum; to the other tube, which serves as a control, is added $\frac{1}{2}$ c.cm. of the serum of a rabbit which has undergone no such treatment. Finally, a third tube should be filled with 4 or 5 c.cm. of the diluted blood from a different species of animals (for example, sheep or pig) to which should be added $\frac{1}{2}$ c.cm. of the serum from the injected rabbit. The three test tubes should be placed in a stove and kept at a temperature of 37° C. If in about an hour the contents of the first tube become at first turbid and later precipitated, while those in the other two tubes remain transparent, it is certain that human blood is present, unless there may be any reason for admitting that the blood could

come from a monkey. These observations have been utilised by Mertens in order to demonstrate the blood origin of albuminuria in cases of Bright's disease. He has found that serum obtained from animals prepared as above always causes a precipitate with human blood and albuminous urine. He also found that albuminous urine may be used in order to prepare animals with as good effect as blood serum or pleural or peritoneal exudation fluid. The blood of the young of an immunised mother obtained just after birth also causes a precipitate.

Now, Uhlenhuth has lately published a modification of this method, by which he claims that it is possible to recognise the different kinds of meat, for example, beef, mutton, pork, and to detect the fraudulent substitution of horse, ass, dog, cat, &c. A small portion of the meat is scraped and left to soak in water or normal salt solution, the process of solution being hastened by adding a few drops of chloroform; the extract is cleared by filtering through filter paper or a Berkefeld filter. A precipitate is formed in this clear fluid, when a few minims of serum, prepared as above described with the blood of the same species of animal, are dropped into it. Dr. Uhlenhuth desires to call the attention of inspectors of meat to this test; where meat is sold as is usual in this country in large joints, it is easy to recognise the different kinds by simple inspection, but where meat is sold in such small pieces that it is impossible to say from what animal it comes, as in Japan and as in the smaller stalls of the poorer markets in Europe, such a test may be found useful. Uhlenhuth points out also that the test is capable of application to minced or potted meat, or sausages, so long as these have not been cooked.

COLONEL GEORGE FLEMING AND THE VETERINARY PROFESSION.

(*Continued from page* 363, *Vol. III.*)

In 1889 Dr. Fleming was one of the witnesses examined by the Royal Commission in Horse-Breeding, and we have no doubt his evidence had much to do with the drawing up of the list of recognised hereditary diseases in the lighter class of horse, namely,—*roaring*, *ringbone*, *navicular disease*, *unsound feet*, *cataract*, and *spavin*; though it is still a matter of regret that the Commission did not include the other hereditary diseases, namely,—*sidebone*, *grease*, and *shivering*, which were suggested by the Royal College of Veterinary Surgeons.

The Times said of the witnesses before this Commission, that "they could not possibly have elected more representative witnesses."

In July 1890 Dr. Fleming retired from the Army, and the *Army and Navy Gazette* stated that "Dr. Fleming has retired from the position of Principal Veterinary Surgeon. The Service loses in him a departmental chief of acknowledged ability, and one who has done much to advance the best interests of veterinary science."

In the same month a letter was addressed to Dr. Fleming by "Zolus," of the *Naval and Military Argus*, and which we reproduce in full, as it shows very typically the position of a veterinary surgeon in the Army of that day.

"*To George Fleming, Esq., LL.D., C.B.*

"SIR,—When the mother of Brasidas, the greatest Lacedemonian warrior of his age, saw her son brought back from the battlefield dead on his shield, she replied to those who attempted condolence, 'Sparta hath many a worthier son than he.' On your retirement from your present post as Principal Veterinary Surgeon to the Army, our cavalry certainly are not in a position to apply such words in your regard, for, although you have trained and educated a goodly number of skilled lieutenants, and leave behind you many a 'vet.' of unimpeachable ability, with you it is a case of 'Eclipse first, the rest nowhere!' A dear friend of my boyhood, lately, alas! gone over to the great majority, J. F. Smith, the novelist (the Alexandre Dumas of the *London Journal* and our best cheap serial literature), was once asked by a Frenchman if he had ever seen the Pope (then Pio Nono). Smith, who, like Ulysses, had travelled much, and knew men and things, drew himself up to his full height, and replied with a sort of Louis Quatorze air he could so well assume, '*Monsieur! J'ai connu plusieurs Papes!*' In like fashion, sir, I can say that, during my soldiering days, 'I have known many "vets."; ' and I may also add they have all been good fellows. A "vet.," my dear Dr. Fleming, has many advantages denied to his brother officers. In his regiment his position is unique. He has no master, no overseer, no rival, while he is equally fortunate in the assurance that no envious critic in the corps can gauge his professional knowledge, or tell accurately how much or how little he knows of the veterinary art. In a really smart cavalry corps the "vet." is *sui generis*, and a sort of grand vizier to the colonel, with whom he has long and mysterious consultation and conference, in which even the adjutant and quartermaster are not included, for, as you are aware, in such a regiment the horses are objects of far greater attention than the men. I suppose this is on the principle that the biped can look after his own health, and the quadruped requires medical supervision. And if he is a *persona grata* to the 'chief,' how much more so is he to the cornets! I beg their pardon; I mean the sub-lieutenants (why must *all* our time-honoured titles be stolen from us?). Has not the inimitable Jorrocks told us that 'ingenuous youth would, at any time, rather have his morals questioned nor his ossmanship?' So, to the ordinary cavalry 'sub' the 'vet.' is 'guide, philosopher, and friend,' a man to be kind to, the object of votive cigars, the priestly recipient of propitiatory brandies and sodas, and an oracle to be consulted upon any subject ranging from navicular disease to prospective matrimony. Even the troop horses get, in process of time, to look upon him as their *medico*, and, could they speak, would, no doubt, ask him to look at their tongues and feel their pulses, while saying 'Don't let them give us such fearful "buckettings" in the Long Valley, with so much dead weight upon our backs. Let our *light cavalry* consist of spare, sinewy men, lightly equipped on well-bred horses, and, above all, sir, suggest to the "authorities" (we wonder who they are!) that we feel deeply the indignity of being made to carry foot soldiers while they are learning to be "mounted infantry!"

"It was Soult, I think, who said 'the British infantry are the finest in the world; luckily for us there are very few of them!' In reviewing your labours of the past years, since you have been at the head of our Army Veterinary Department, and in perusing your admirable though tersely-worded annual reports, we can give similar praise, with an equivalent reservation, to the cavalry over which you, sir, have exercised the super-

vision of medicine, farriery, and hygiene. Like the accomplished *cordon bleu* who can turn out a banquet from a few scraps, or the *chef* who produces *morue à la bechamel* with turnips, a little cream, and tarragon vinegar, you have so husbanded the scanty materials placed at your disposal by our penny wise and pound foolish military executive that you have enabled our attenuated and overworked squadrons, where 13,027 troop horses and 1653 officers' chargers are all we can muster for our cavalry forces in this country, South Africa, and Egypt, to perform duties, which, in poorer nations, would be allotted to ten times that number. Under your charge the British cavalry for the last two years has been the only mounted force in Europe free from those terrible scourges in the French and Russian armies, glanders and farcy, which, in the civilian stables of our own large towns, are diseases unfortunately always prevalent. With the care and excellent rules of stable management you have been the chief means of introducing into our barracks, the average age of our troop horses and their average length of service have been increased respectively to eight years and seven months and seven and a half years. You can, at the present time, likewise show us, doing active troop duties, seven horses more than twenty years old! The adoption of your recommendations made last year in regard to the sale of cast (or, as it is artfully worded, 'surplus') horses, has raised the average prices of those animals to the unprecedented figure of £11 : 2 : 6, a price, sir, which may possibly have reminded you of the aphorism of that 'unhappy nobleman,' who was at one time 'languishing in prison,' 'some men has money and some men has brains!' the purchasers in this case evidently belonging to the former category. If my old chief, Sir James Scarlett, or his contemporary, Lord Cardigan, could revisit again 'the glimpses of the moon,' and inspect the remounts purchased for our confiding War Minister by Colonel Ravenhill and his agents, the former *beaux sabreur*, I fear, would suffer from much tonsorial manipulation. In spite of the competition in open market of French, German, and Italian military agents, who always outbid our Government purchasers, we have still in these islands an average yearly of some 100,000 young horses, upon which we could rely as being fit to carry a dragoon, lancer, or hussar. I feel sure you will corroborate me when I say that we have plenty of retired cavalry officers and gentlemen, like yourself, who do know 'a horse from a cow' (not invariably the case with our official purchasers) ready and willing, as well as perfectly competent, to act as Government remount agents.

"How you must have been amused, although no doubt humiliated, at hearing for the last three years of these ever-contemplated but never realised, '*two* Army corps.' These would require, even with our circumscribed proportion of cavalry, 22,966 horses, when, according to your own returns, the total number of animals at the disposal of the military authorities, allowing of course for illness and other casualties, has seldom, if ever, been more than 10,000, or less than the number required to equip *one* Army corps! These islands were once the great depôts and nurseries for the best breeds of military horses, but year by year we have allowed all our best blood to be purchased by the foreigner (with whom some day we may have to fight!) and taken out of our country, so that even in peace time the regiments of our little Army are far above our resources. Between 1863 and 1872 170,000 were *imported*, and between 1872 and 1882 another 179,000 animals came to us from abroad, making a total in twenty

years of 376,000 horses, which could have been bred and reared by our own farmers with the smallest encouragement or aid from the Government. Assuming these horses to be worth on an average only £25 a head, we arrive at a loss of some thirteen millions sterling to the farmers!

Now, my dear Dr. Fleming, if you or I wanted to mount all our cavalry with good cattle within a month, do you think we should apply to Colonel Ravenhill or his coadjutors, or indulge that officer in his little fad of sending the taxpayers' money out of the country to Hungary, Canada, or Jamaica? I trow not, for we could appeal to the experience as well as the patriotism of such men as Sir George Wombwell, Lord Tredegar (late 17th Lancers), General Dickson (late 16th Lancers), Sir Thomas Barrett Lennard, and other Army men and foxhunters, who need no middlemen when they want good-tempered, active, sizeable, comely, sound, sinewy, muscular, and, above all, well-bred horses, fit for hunting-field, battle-field, park, road, or plough. What says Sir George Wombwell, one of our most eminent and trustworthy authorities, being, in himself, looked upon in 'horsey' circles as a sort of court of final appeal on equine questions?

"The Government should most undoubtedly stop the exportation of mares for a few years to begin with. Then it should send into various districts *men who have been in the Army*, who are good judges of horses, and who would be thankful for a small annuity to buy cavalry mounts direct from the breeder. The farmer now sells to the middleman, who saves him the trouble of going to York or Northallerton Fair, where he is quite lost. If the Government stationed agents, chosen from retired cavalry officers, in horse-breeding districts, the producer would probably sell to them direct for £5 or so more per horse than he now gets, while the Government would obtain the pick of his stable at a less cost than is now paid to the middlemen, whose market for his best horses are French and German agents, who can give £55 for a remount for which the Government will only offer £40.

"But our 'afternoon stables,' sir, have usurped the time I had purposed devoting to your more immediate personality, for I believe that, in my present correspondent, I have a listener even more sympathetic than those service members of Parliament who are, like yourself, identified with our neglected cavalry. On the next occasion of our foregathering at the Constitutional Club, where we have so often discussed this question, I hope in person to wish you all prosperity on your retirement. I have the honour to remain, your obedient servant, ZOLUS."

But though Dr. Fleming had retired from the army he had no intention of stopping work, and in the same year we read an exhaustive paper by him on "Variola in Man and in Animals," and published in the *Medical Press and Circular*.

In 1891 the second edition of Chauveau's *Comparative Anatomy of the Domesticated Animals* was edited and enlarged by Dr. Fleming, and in 1892 he translated, edited, and produced *Parasites and Parasitic Diseases of Domesticated Animals*, by Professor Neumann, of the National Veterinary College of Toulouse.

In the *Lancet* of June 11th, 1892, Dr. Fleming published a most interesting article on *The so-called Venereal Diseases in Animals;* and again in the same journal in August 20, 1892, he drew attention to cases of *Graves and Basedow's Disease in Animals;* and in September drew attention to the frequent occurrence of tuberculosis in dogs.

In December 1894 Dr. Fleming retired from the editorship of this Journal.

In March 1896 Her Gracious Majesty Queen Victoria "approved of a Good Service Pension being conferred upon Principal Veterinary Surgeon George Fleming, retired pay."

In 1898 he wrote a strong article on the "Wanton Mutilation of Animals," and as a result of his efforts, the Royal Agricultural Society of England, at a meeting on the 2nd November 1898, passed a resolution that, "At and after the Maidstone Meeting of 1899, no foals with docked tails be allowed to be exhibited at the Society's County Meetings; that at and after the meeting of 1900 the same rule shall apply to yearlings as well as to foals; and that at and after the meeting of 1901, to two-year-olds also."

This was Dr. Fleming's greatest achievement, and if there be a hereafter for the lower animals his name will be well-remembered there, as this effect has saved terrible suffering to countless numbers of poor dumb creatures.

Dr. Fleming, for this alone, deserves even to hold a high place in the memory of all men.

Up to the day of his death he was at work, and the day before he died he was re-elected an Examiner for the Fellowship and Membership of the Royal College of Veterinary Surgeons. We all mourn the loss of one of our giants.

Legal News.

KNARESBOROUGH COUNTY COURT.

Friday, November 8th.

Before His Honour Judge TEMPLER.

ALLEGED INJURY TO A MARE.

CONSIDERABLE interest was manifested in the following case, in which George Murgatroyd, cab proprietor, of Walker Road, Harrogate, brought an action against Arthur Ellison, veterinary surgeon, Harrogate, to recover the sum of £50 damages through the alleged injury to a mare, the latter was called in to treat for an obstruction in the gullet. The case was tried before a jury. Mr. Harold Newell (instructed by Mr. T. Laycock, solicitor, Harrogate and Knaresborough) was for the plaintiff; and Mr. T. R. D. Wright (instructed by Mr. F. Barber, solicitor, Harrogate) defended. Mr. Newell, in opening the case, contended that the defendant had been guilty of negligence in treating a mare belonging to plaintiff, and that he ought to have had her "cast" before commencing the operation with the probang, an instrument for removing obstructions in the throat. He then called the plaintiff, George Murgatroyd, who stated that he was a cab proprietor at Harrogate. Ellison had been his regular veterinary surgeon. The mare was driven in one of his cabs by a man named Stott. On Friday, the 5th July, it had been driven by Stott throughout the day in Harrogate, and he got in about eight o'clock. The mare was all right, but warm, and seemed as usual. Stott took her out of the cab and started dressing her feet

years of 376,000 horses, which could have been bred and reared by our own farmers with the smallest encouragement or aid from the Government. Assuming these horses to be worth on an average only £25 a head, we arrive at a loss of some thirteen millions sterling to the farmers!

Now, my dear Dr. Fleming, if you or I wanted to mount all our cavalry with good cattle within a month, do you think we should apply to Colonel Ravenhill or his coadjutors, or indulge that officer in his little fad of sending the taxpayers' money out of the country to Hungary, Canada, or Jamaica? I trow not, for we could appeal to the experience as well as the patriotism of such men as Sir George Wombwell, Lord Tredegar (late 17th Lancers), General Dickson (late 16th Lancers), Sir Thomas Barrett Lennard, and other Army men and foxhunters, who need no middlemen when they want good-tempered, active, sizeable, comely, sound, sinewy, muscular, and, above all, well-bred horses, fit for hunting-field, battle-field, park, road, or plough. What says Sir George Wombwell, one of our most eminent and trustworthy authorities, being, in himself, looked upon in 'horsey' circles as a sort of court of final appeal on equine questions?

"The Government should most undoubtedly stop the exportation of mares for a few years to begin with. Then it should send into various districts *men who have been in the Army*, who are good judges of horses, and who would be thankful for a small annuity to buy cavalry mounts direct from the breeder. The farmer now sells to the middleman, who saves him the trouble of going to York or Northallerton Fair, where he is quite lost. If the Government stationed agents, chosen from retired cavalry officers, in horse-breeding districts, the producer would probably sell to them direct for £5 or so more per horse than he now gets, while the Government would obtain the pick of his stable at a less cost than is now paid to the middlemen, whose market for his best horses are French and German agents, who can give £55 for a remount for which the Government will only offer £40.

"But our 'afternoon stables,' sir, have usurped the time I had purposed devoting to your more immediate personality, for I believe that, in my present correspondent, I have a listener even more sympathetic than those service members of Parliament who are, like yourself, identified with our neglected cavalry. On the next occasion of our foregathering at the Constitutional Club, where we have so often discussed this question, I hope in person to wish you all prosperity on your retirement. I have the honour to remain, your obedient servant, ZOLUS."

But though Dr. Fleming had retired from the army he had no intention of stopping work, and in the same year we read an exhaustive paper by him on "Variola in Man and in Animals," and published in the *Medical Press and Circular*.

In 1891 the second edition of Chauveau's *Comparative Anatomy of the Domesticated Animals* was edited and enlarged by Dr. Fleming, and in 1892 he translated, edited, and produced *Parasites and Parasitic Diseases of Domesticated Animals*, by Professor Neumann, of the National Veterinary College of Toulouse.

In the *Lancet* of June 11th, 1892, Dr. Fleming published a most interesting article on *The so-called Venereal Diseases in Animals;* and again in the same journal in August 20, 1892, he drew attention to cases of *Grave's and Basedow's Disease in Animals;* and in September drew attention to the frequent occurrence of tuberculosis in dogs.

In December 1894 Dr. Fleming retired from the editorship of this Journal.

In March 1896 Her Gracious Majesty Queen Victoria "approved of a Good Service Pension being conferred upon Principal Veterinary Surgeon George Fleming, retired pay."

In 1898 he wrote a strong article on the "Wanton Mutilation of Animals," and as a result of his efforts, the Royal Agricultural Society of England, at a meeting on the 2nd November 1898, passed a resolution that, "At and after the Maidstone Meeting of 1899, no foals with docked tails be allowed to be exhibited at the Society's County Meetings; that at and after the meeting of 1900 the same rule shall apply to yearlings as well as to foals; and that at and after the meeting of 1901, to two-year-olds also."

This was Dr. Fleming's greatest achievement, and if there be a hereafter for the lower animals his name will be well-remembered there, as this effect has saved terrible suffering to countless numbers of poor dumb creatures.

Dr. Fleming, for this alone, deserves even to hold a high place in the memory of all men.

Up to the day of his death he was at work, and the day before he died he was re-elected an Examiner for the Fellowship and Membership of the Royal College of Veterinary Surgeons. We all mourn the loss of one of our giants.

Legal News.

KNARESBOROUGH COUNTY COURT.

Friday, November 8th.

Before His Honour Judge TEMPLER.

ALLEGED INJURY TO A MARE.

CONSIDERABLE interest was manifested in the following case, in which George Murgatroyd, cab proprietor, of Walker Road, Harrogate, brought an action against Arthur Ellison, veterinary surgeon, Harrogate, to recover the sum of £50 damages through the alleged injury to a mare, the latter was called in to treat for an obstruction in the gullet. The case was tried before a jury. Mr. Harold Newell (instructed by Mr. T. Laycock, solicitor, Harrogate and Knaresborough) was for the plaintiff; and Mr. T. R. D. Wright (instructed by Mr. F. Barber, solicitor, Harrogate) defended. Mr. Newell, in opening the case, contended that the defendant had been guilty of negligence in treating a mare belonging to plaintiff, and that he ought to have had her "cast" before commencing the operation with the probang, an instrument for removing obstructions in the throat. He then called the plaintiff, George Murgatroyd, who stated that he was a cab proprietor at Harrogate. Ellison had been his regular veterinary surgeon. The mare was driven in one of his cabs by a man named Stott. On Friday, the 5th July, it had been driven by Stott throughout the day in Harrogate, and he got in about eight o'clock. The mare was all right, but warm, and seemed as usual. Stott took her out of the cab and started dressing her feet

XUM

as he usually did. A pail of potatoes was stood near the door, and the mare made for it and made a grab. He said to Stott, "Stop her, don't let her have any of them." Stott commenced to dress her feet again, and the mare made for the water. She got a drink of water and it all came down her nostrils. They put her in the stall and did not think anything was wrong. They sent for him (plaintiff) about half-past ten, and the mare looked all right in the stand, but did not touch her food. He then ordered them to take her up to Mr. Ellison's at once, and not to tamper with her in any shape or form. Stott took her up, and he (plaintiff) next saw the mare on Saturday morning. She looked funny and seedy, and never touched anything. They gave her gruel and a pint of linseed oil, as Mr. Ellison directed, and he told the men to spare no pains to bring her round. She got worse. He saw her on Monday morning after Ellison had treated her on Sunday night. She looked in a poor and emaciated state, and he sent for Mr. Hamilton. He said to him, "What about the mare?" and he said, "I would not give that (snapping his fingers) for her." He (plaintiff) treated the mare as Mr. Hamilton told him. Ellison left the probang on the premises, but he (Hamilton) did not use it. The mare died on Tuesday night about half-past eight. The mare cost him £30 in November 1900. She was about eight years old. He bought it of Mr. Wilks, of Leeds. Mr. Ellison told him it was a good mare. He had been put to a lot of inconvenience and expense. He had to find another horse in the height of the season. By Mr. Wright: He kept a good class of cattle. He gave £30 for the mare. He had a mare which cost him £25, and he gave that and £5 to "boot" for her. The mare he exchanged kicked a bit, that was all. He wrote John Wilks a cheque for £25 for the first one. He had four other horses, and tried to buy another when the mare died. He bought one for £21 a few weeks after. There was not enough horses to run his yard or he should not have bought another. He could not buy one sooner because he had not the money. He waited about a month. He bought one of Leech and another of England. It was perhaps five or six weeks after the mare died that he bought another horse; he was not certain. It cost £21 and was alive and all right. His son was in the business. He (witness) did not attend to a fried fish shop. Mrs. Binns cleaned fish in the yard. The fish was in tubs. The pail was full of potato parings and one thing and another. There were no fish bones there that day. He did not know anything before the mare touched it, but he knew after. He could tell what was in the pail. She made a grab at it. Witness said the pail had only potatoes in and not parings; he was positive. His Honour: What makes you positive? Witness: There were no fish bones in after or before. Mr. Wright: You didn't look before? Witness: I saw it standing. Further cross-examined, witness said Ellison had attended the mare before for sidebones, it having got shook in the hansom. By Mr. Newell: He bartered a mare worth £25 and gave £5 to "boot" for the mare that died. He bought her from the same man—John Wilks. Witness was questioned at some length by His Honour, and maintained there was nothing but potatoes in the pail. Henry Stott, who drove the mare in question, said he took her to defendant's place, and he described how defendant used the probang, and said he asked him to give him a hand. James Murgatroyd, plaintiff's son, said defendant took the shield off when he used the stiletto, and put it on the bin. William Hudson and Harry Moxon, cab-drivers, also said

defendant took the shield off the stiletto. William Hamilton, M.R.C.V.S., said that on the Sunday night in question he was called to see the mare about half-past eleven o'clock. He found her suffering from perforation of the œsophagus. He could tell that by examination. He went on Monday and Tuesday, and the mare was rapidly getting worse. He did not know another veterinary had been employed. The mare died, and he made a post-mortem examination on Wednesday morning. Mr. Ellison was not present. There was another independent veterinary there. When he made the post-mortem he noticed there was inflammation of the lungs. He thought the perforation of the œsophagus was the cause of the inflammation. The gullet was joined to the lungs owing to the inflammation. The perforation has been caused by some sharp instrument. There was no fish bone in the stomach. There was some potato pulp in the stomach. In reply to His Honour, witness said that if the mare had got a potato in her throat, and it had been gradually absorbed, she would have been all right. If the probang was passed he thought it had caused the wound. (What was said to be a portion of the mare's œsophagus was produced in Court, and the witness pointed out the perforation.) The corkscrew end had perforated the gullet. Samuel Bradley, M.R.C.V.S.; F. P. Carter, F.R.C.V.S.; A. W. Mason, late President of the Royal College of Veterinary Surgeons; and Professor J. Wortley Axe, London, were called by the plaintiff. Mr. Wright submitted there was no evidence of negligence, but His Honour thought there was something to go to the jury. Mr. Wright, having addressed the jury, called Arthur Ellison, the defendant, who said he bought the business of the late Mr. Fergusson at Harrogate, and had been practising there for over two years. Before that he had charge of 3000 horses in London, and previous to that was head assistant to Messrs. J. and A. Lawson, of Manchester, the largest veterinary establishment out of London. He first saw the mare of Mr. Murgatroyd in March, and had her under treatment for lameness. She was ten or twelve years old and was never practically sound, but could "dodge" along. He blistered her, and saw her from time to time until the day of that unfortunate occurrence. He valued her at £15. He remembered Stott bringing her to him, and he said he thought she had been at the potato bucket and got a fish bone or something. He examined her, and she made frequent attempts at vomition. He tried her with a drink of warm water and it came down the nostrils. He then gave her some linseed oil and warm water. He could not tell what the obstruction was, but there was no doubt but that there was one. He put down the probang until it stopped. (Witness here pointed out to His Honour on a sketch of a horse's œsophagus, &c., where he located the obstruction.) He could judge that, he said, from the length of the probang that went into the chest. If there was nothing in the œsophagus, it would go down with great ease into the stomach. After he had passed the probang he thought he would give nature a chance. He did not use the corkscrew stiletto either on Friday or Sunday. He sent the mare home on Saturday morning, when she seemed a little better. Previous to that Mr. Murgatroyd had been down and told him the mare was better. Plaintiff's son came down on Sunday night between half-past six and seven. He said the mare was no better, and he thought she was going to die. He said to him he could do no more for her. He knew by that time the mare was in a bad condition, and if she was not better she would not recover. Plaintiff's son said,

XUM

"Shall I send for the cart," and witness replied, "While there's life there's hope," and he went and got the probang and passed it again. He had the mare brought out of the stable into the yard. Two men held its head up after he had administered some oil, and he then oiled the probang and withdrew the stiletto. He had no difficulty in getting the probang into the horse's mouth. When he got the probang a certain distance he inserted the stiletto, but never took off the shield, and without any difficulty removed the obstruction. As he removed the probang a lot of pieces of potato came with it on to the floor. He thought the mare died from septic pneumonia, and he told plaintiff so. She stunk so badly, that made him think so. If it had belonged to any one but a poor man he should have ordered it to have been destroyed. He agreed with Mr. Hamilton that it suffered from septic pneumonia, which was really gangrene of the lungs. He left the mare on Sunday night. He heard on Wednesday morning that the mare was dead. They never asked him to go to the post-mortem examination or gave him a chance. By Mr. Newell: You were told you could see the œsophagus that had been punctured—(pointing to it on the table.) Defendant: How do I know that belonged to the mare? It was their duty to let me be present. He did not say the witnesses had told lies about that being the œsophagus of the mare. He did not remove the shield from the stiletto; he had witnesses to prove that. He removed the obstruction, but it was too late. William Bellerby, plumber, 2 Robert Street, Harrogate, stated he went with the defendant to plaintiff's stables on the day in question. When they returned in the hansom to Mr. Ellison's, young Murgatroyd said to him, whilst they waited for Mr. Ellison, "We clean fish in the yard, and I should not be surprised if she's got a fish bone." Before that he knew nothing about the fish bone. He described how the defendant used the probang, and said the shield slipped down the stiletto, and defendant said, "My word, we must have this on." Thomas Knapton, groom, Harrogate, said he was quite certain the shield was on when defendant used the stiletto, because he had hold of it. George Carter, veterinary surgeon, said he had been in practice for twenty-five years, and he never "cast" a horse to use the probang. G. E. Bowman, Henry Snarry, and G. Deans, veterinary surgeons, also gave evidence for the defence, and did not think it was necessary to "cast" a horse to use the probang. After counsel on both sides and His Honour had addressed the jury, they retired, and on their return the foreman said they found there had been no negligence, and gave a verdict for the defendant. His Honour allowed costs on scale B, and made allowances for scientific witnesses and advising on evidence. Mr. Newell, who appeared for plaintiff, objected to allowances for scientific witnesses. His Honour: You cannot do that. Mr. Newell: My client has been put to considerable expense. His Honour: He ought not to have brought this action.—(Loud laughter.)

Extracts.

ADENOMA OF THE MAMMARY GLAND.

BY MM. BALL AND SEHLANC.

Among the domestic animals adenomata are generally seen in the dog and cat, and can be classed as "true adenoma," "fibro-adenoma," and "myxo-

adenoma." In the human being "delbert" were always the result of chronic inflammation; they are of slow growth, never become generalised, and after removal do not recur. In the dog they are usually seen involving the glands most exposed to injury.

True adenoma.—They are rare in the dog, the authors have only seen one authentic case. They are formed by epithelial nodules surrounded by a thin and very delicate conjunctive stroma.

Fibro-adenomata.—These are common, and will invade one or more mammæ—they are sometimes as large as a man's fist. On account of their size and situation they are pendulous from a pedicle, and being exposed to contusions they become ulcerated and suppurate. They are always firm in consistence, and the formation of small cysts gives them a mamelonated appearance. On section they have a greyish white or yellow appearance, with interlaced fibres, and studded over with small cysts containing a viscid transparent fluid of a dull yellow or deep brown colour.

Histologically, fibro-adenomata are formed of large fibrous bands spread between isolated or agglomerated epithelial cavities, and they are of very variable forms.

Granular fibro-adenomata are only a variety of the above in which there are a large number of cystic cavities. The pericystic conjunction is the seat of growth of granulations of a variable size, which surround the wall of the cyst and form granular masses in the interior.

Myxo-adenomata are of a soft encephaloid consistency, and are composed of masses of mucous tissue in the middle of which are a small number of glandular neoformations. Cysts are absent, and the tumours are always encapsuled. They are not so common as the fibro-adenomata.

(*Journal de Médecine Vétérinaire et de Zootechnie.*)

JOSHUA A. NUNN,
Vety. Lt. Colonel.

April 1901.

STENOSIS OF THE TRACHEA IN THE HORSE AFTER TRACHEOTOMY.

BY PROFESSOR PRUCH.

CONSTRICTION of the trachea two or three months after tracheotomy is a serious accident that is not infrequent. It is generally attributed to the use of tubes of too large a calibre, which bruise the tissues and require a large incision for their insertion. No doubt this is one of the causes, but there are others. MM. Cadiot and Almy consider that the way in which the incision into the trachea is made is an important factor, and advise that a semicircle be removed from each ring so that the opening extends into two.

M. Pruch, on the contrary, advises a vertical incision through three rings, as it does not involve a loss of tissue, facilitates the introduction of the tube, and prevents bruising and injury. It would seem, however, that the plan of operation is not of great importance, the chief care being to make the opening proportionate to the diameter of the tube, so that it can be replaced easily by an unskilled attendant without injuring the part.

(*Journal de Médecine Vétérinaire et de Zootechnie.*)

JOSHUA A. NUNN,
Vety. Lt. Colonel.

May 1901.

Army Veterinary Department.

We have much pleasure in congratulating Vet.-Lieutenant-Colonel J. A. NUNN, C.I.E., D.S.O., on his appointment as Deputy Director-General of the Army Veterinary Department.

CONTAGIOUS DISEASES ANIMALS ACTS, 1864 AND 1890.

SUMMARY OF RETURNS OF OUTBREAKS for the Four Weeks ending 14th November 1901.

ENGLAND AND WALES.

Swine Fever.	Anthrax.	Glanders (including Farcy).	Sheep-Scab (for month of October).
Outbreaks 110 Slaughtered 525	Outbreaks 23 Attacked 51	Outbreaks 96 Attacked 171	Outbreaks 61
SCOTLAND.			
Outbreaks 3 Slaughtered 43	Outbreaks 21 Attacked 29	Outbreaks 2 Attacked 5	Outbreaks 3
IRELAND.			
Outbreaks 9 Slaughtered 175	Outbreaks 1 Attacked 2	None.	Outbreaks 21

Communications, Books, Journals, &c., Received.

Agricultural Journal (Cape of Good Hope); Berliner Thierärztliche Wochenschrift; La Clinica Veterinaria (Milan); Deutsche Thierärztliche Wochenschrift; Tannoform in Veterinary Medicine (March); The Sanitary Journal; Scottish Medical and Surgical Journal; Veterinary Record; La Riforma Veterinaria; Le Mois Scientifique (Paris); L'Echo Vétérinaire (Liège); Annales de Médecine Vétérinaire (Brussels); Johns Hopkins Hospital Reports; Journal of Comparative Medicine and Veterinary Archives; Recueil de Médecine Vétérinaire; Gazette Médicale de Paris; Modern Medicine; Johns Hopkins Hospital Bulletin; Il Veterinario di Campagna (Moncalieri); Le Bulletin Vétérinaire (Orleans); Revista de Medicina Veterinaria (Bucarist); La Revista Veterinaria (Buenos Aires); Zeitschrift für Fleisch-und Milchhygiene (Berlin).

FOR THE VETERINARY SURGEON.

MALLEIN.
For Diagnosing Glanders.

ANTITETANUS SERUM.
For Veterinary Use.

BLACK LEG VACCINE.
A prophylactic against Blackleg (or Quarter-Evil).

TUBERCULIN.
After Koch's original Formula. For Diagnosing Tuberculosis in Cows, &c.

VETERINARY HYPODERMIC TABLETS.
(Soluble; Accurate; Permanent.)

EMPTY GELATIN CAPSULES.
(1 oz., ½ oz., ¼ oz.)

STANDARDISED FLUID EXTRACT BELLADONNA.

A FULL LINE OF
STANDARDISED FLUID EXTRACTS
For the preparation of Tinctures.

PRODUCTS WORTHY OF YOUR ATTENTION.

Please write for Literature.

PARKE, DAVIS, & Co.,

111, QUEEN VICTORIA ST., LONDON, E.C.

Telegraphic Address—
"CASCARA, LONDON."

Telephone No. 6940 Bank.

DR. J. COLLIS BROWNE'S
CHLORODYNE.

COUGHS, COLDS, ASTHMA, BRONCHITIS.

DR. J. COLLIS BROWNE'S CHLORODYNE.—Dr. J. C. BROWNE (late Army Medical Staff) DISCOVERED a REMEDY, to denote which he coined the word CHLORODYNE. Dr. BROWNE is the SOLE INVENTOR, and, as the composition of Chlorodyne cannot possibly be discovered by Analysis (organic substances defying elimination), and since the formula has never been published, it is evident that any statement to the effect that a compound is identical with Dr. Browne's Chlorodyne *must be false.*

DR. J. COLLIS BROWNE'S CHLORODYNE. — Vice-Chancellor Sir W. PAGE WOOD stated publicly in Court that Dr. J. COLLIS BROWNE was UNDOUBTEDLY the INVENTOR of CHLORODYNE, that the whole story of the defendant Freeman was deliberately untrue, and he regretted to say it had been sworn to.—See *The Times*, July 13th, 1864.

DR. J. COLLIS BROWNE'S CHLORODYNE is the TRUE PALLIATIVE in

NEURALGIA, GOUT, CANCER, TOOTHACHE, RHEUMATISM.

IS THE GREAT SPECIFIC FOR

CHOLERA, DIARRHŒA, DYSENTERY.

GENERAL BOARD of HEALTH, LONDON, REPORT that it ACTS as a CHARM, one dose generally sufficient.

Dr. GIBBON, Army Medical Staft, Calcutta, states: "2 DOSES COMPLETELY CURED ME OF DIARRHŒA."

The ILLUSTRATED LONDON NEWS of Sept. 28, 1895, says:

"If I were asked which single medicine I should prefer to take abroad with me, as likely to be most generally useful, to the exclusion of all others, I should say CHLORODYNE. I never travel without it, and its general applicability to the relief of a large number of simple ailments forms its best recommendation."

DR. J. COLLIS BROWNE'S CHLORODYNE rapidly cuts short all attacks of

EPILEPSY, SPASMS, COLIC, PALPITATION, HYSTERIA.

IMPORTANT CAUTION. — The IMMENSE SALE of this REMEDY has given rise to many UNSCRUPULOUS IMITATIONS. Be careful to observe Trade Mark. Of all Chemists, 1s. 1½d., 2s. 9d., and 4s. 6d.

Sole Manufacturer: J. T. Davenport, 33 Gt. Russell St., London, W.C.

London: Printed by Baillière, Tindall & Cox, 8 Henrietta Street, Strand London, W.C.

ORIGINAL AND